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Hon. Commissioner of Patents and Trademarks,  
Washington, D.C. 20231

SIR:

CERTIFIED TRANSLATION

I, Takashi Narita, am an official translator of the Japanese language into the English language and I hereby certify that the attached comprises an accurate translation into English of Japanese Application No. P10-338917, filed on November 30, 1998.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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[Name of Invention] INFORMATION PROVIDING APPARATUS AND  
INFORMATION PROVIDING METHOD

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[Document]	Specification	1
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[Document]	Drawing	1
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[Name of Document] SPECIFICATION

[Title of the Invention]

INFORMATION PROVIDING APPARATUS AND INFORMATION

PROVIDING METHOD

[CLAIMS]

[Claim 1]

An information providing apparatus adapted for displaying various information screens provided through a plurality of information sources,

the information providing apparatus serving:

to acquire the information screens through a network from at least one of the information sources;

to acquire, through the network, information for index of the information screens which can be displayed; and

to display, on the basis of the acquired information, a menu screen in which the information screens are categorized; and

to display a corresponding one of the information screens in response to selection operation on the menu screen.

[Claim 2]

The information providing apparatus according to claim 1,

wherein the information screens are images of various programs, and the index information is program guide of the respective programs.

[Claim 3]

An information providing method of displaying information screens provided through a plurality of information sources,  
the information providing method comprising:  
acquiring, through a predetermined network, the information screens from at least one of the information sources;  
acquiring, through the network, information for index of the information screens which can be displayed;  
displaying, on the basis of the acquired information, a menu screen in which the information screens are categorized; and  
displaying a corresponding one of the information screens in response to selection on the menu screen.

[Claim 4]

The information providing method according to claim 4,  
wherein the information screens are images of various programs, and the index information is program guide of the respective programs.

[Detailed Description of the Invention]

[0001]

[Field of the invention]

The present invention relates to an information providing apparatus and an information providing method, and can be applied to, for example, a set-top box

for digital satellite broadcasting service. The present invention is adapted to acquire index information through the network to categorize information screens by such index information to form a menu screen, whereby even in the case where information screen such as a large number of programs, etc. are provided from a plurality of information sources, selection of a desired program, etc. are provided, selection of a desired program is easily and quickly enabled.

[0002]

[Prior Art]

Conventionally, in a set-top box, etc. for digital satellite broadcasting service, broadcasting contents, etc. of respective channels are displayed, for example, on a multi-screen in order that a desired channel can be selected easily from a large number of channels.

[0003]

[Problems to be solved by the invention]

Meanwhile, in video equipments of this kind, for example, it is conceivable that a recording/reproducing device such as an optical disk device, a hard disk device or the like is connected thereto to provide not only programs by broadcasting, but also programs of various media. In this case, it is deemed that the number of programs by broadcasting is increased

[0004]

If selection of necessary information is quickly and precisely enabled with

an increase of information to be provided as stated above, it is considered that operability (convenience of use) of information equipments of this kind can be improved.

[0005]

The present invention has been made in view of the above problems and has an object to provide an information providing apparatus, and an information providing method in which even in the case where information screens of a large number of programs, etc. are provided from a plurality of information sources, selection of a desired program can be easily and quickly made.

[0006]

[Means for solving the problems]

In order to solve such problems, the present invention is applied to the information providing apparatus or the information providing method to acquire, through a network, information for index of information screens which can be displayed to display, on the basis of the acquired information, a menu screen in which information screens are categorized to display corresponding information screen in response to selection operation on the menu screen.

[0007]

If index information of information screen which can be displayed is acquired through the network, even in the case where information screens are provided from various external equipments connected to the network, it is possible

to acquire index information with respect to the information screens. Moreover, it is also possible to obtain individual information provided by Internet, etc. through the network. Thus, if the menu screen in which information screens are categorized is displayed on the basis of the acquired information to display corresponding screen in response to selection operation on the menu screen, it is possible to unitarily perform management of a large number of information screens provided from plural information sources. Thus, it is possible to easily and quickly select a desired program.

[0008]

[Best Mode For Carrying Out the Invention]

Embodiments of the present invention will be described in detail by making reference to attached drawings as occasion demands.

[0009]

(1) Configuration of Embodiments

(1-1) Entire configuration

FIG. 1 is a block diagram showing a set-top box according to the embodiment of the present invention. In this set-top box 1, a tuner 2 receives broadcasting waves of digital satellite broadcasting or broadcasting waves of digital ground waves which are down-converted through an antenna 3 to demodulate a desired transport stream from these broadcasting waves in accordance with control of an internal control section 4. Further, the tuner 2



demodulates image data and audio data from the demodulated transport stream in accordance with control of an internal control section 4 to output them together with an Electronic Program Guide (EPG).

[0010]

A program information extraction section 5 extracts electronic program information from output data from the tuner 2 to output the information thus obtained to the internal control section 4, and to respectively output image data and audio data to a video signal processing section 6 and an audio signal processing section 7.

[0011]

Under control by the internal control section 4, the video signal processing section 6 serves to expand and output image data outputted from the program information extraction section 5 and image data which is inputted from a video disk recorder 8 as an external equipment. In this case, it is assumed that the image data is caused to undergo transmission after undergone data compression by the format of MPEG (Moving Picture Experts Group), for example.

[0012]

Moreover, in the case where a desired program is recorded by the video disk recorder 8 under control by the internal control section 4, the video signal processing section 6 outputs image data outputted from the program information extraction section 5 to the video disk recorder 8. At this time, the video signal

processing section 6 detects a scene change by comparing sequential frames with each other to output the scene-changed image to the video disk recorder during recording by still image (hereinafter referred to as index image). In this manner, the video signal processing section 6 records an index image of each of scenes constituting a program, into the video disk recorder 8. Further, the video signal processing section 6 notifies the internal control section 4 of time information indicating the relationship between the still image thus recorded and original image data. As a result of this, in the set-top box 1, index images thus recorded are used so that a scene desired by user can be selected simply.

[0013]

A video mixing section 9 synthesizes image data outputted from the video signal processing section 6 and image data outputted from a graphics display signal preparation section 10 to output the synthesized data to a monitor device 11. In this manner, in the set-top box 1, a desired program can be watched and heard by the monitor device 11, and various menu screens necessary for selection of this program can be viewed with eyes. At this time, under control by the internal control section 4, the video mixing section 9 synthesizes outputs these two image data by processing such as cross-fading or the like to output the synthesized image data, and to also synthesize image data through keying such that an image based on the image data outputted from the video signal processing section 6 is embedded at a part of an image based on image data outputted from the graphics display signal

preparation section 10.

[0014]

The audio signal processing section 7 expands the audio data outputted from the program information extraction section 5 and audio data inputted from the video disk recorder 8 as an external device to output the audio data thus expanded to the speaker 12. In this manner, in the set-top box 1, sound of a desired program can be heard through a speaker 12 with respect to a desired program. Also, under control by the internal control section 4, the sound signal processing section 7 outputs audio data outputted from the program information extraction section 5 to the video disk recorder 8 in the state linked with the video signal processing section 6 in the case where a desired program is recorded.

[0015]

The video disk recorder 8 is one of various media which can be connected to the set-top box 1, and a video tape recorder, a compact disk player, a hard disk device, and/or an optical disk device are applied as the medium in this embodiment.

[0016]

A home-net input/output control section 13 is a control section of an interface in this set-top box 1 with respect to a home-network to which the video disk recorder 8 and the like is connected through an IEEE1394 interface, and controls the operation of the video disk recorder 8 under control by the internal

control section 4. In this manner, in the set-top box 1, programs based on digital satellite broadcasting and digital ground wave can be recorded into the video disk recorder 8, and programs recorded in the video disk recorder 8 and/or programs provided by optical disk can be watched and heard.

[0017]

Moreover, in recording programs based on digital satellite broadcasting or digital ground wave broadcasting into the video recorder 8 in this way, the home-net input/output control section 13 records program information, index images, and the like concerning these programs together under control by the internal control section 4, and selectively reproduces these information, index images, and the like under control by the internal control section 4 to notify the internal control section 4 and the like of them.

[0018]

Further, the home-net input/output control section 13 notifies the internal control section 4 of detailed program information, data concerning recording reservation, and the like acquired from a predetermined server through, e.g., a telephone line, in addition to the processing as described above. The home-net input/output control section 13 also notifies the internal control section 4 of detailed program information acquired from a CD-ROM loaded at the video disk recorder 8. In this manner, the set-top box 1 can acquire detailed program information from various information sources with respect to various programs

which can be provided for users.

[0019]

Under control by the internal control section 4, the graphics display signal preparation section 10 generates and outputs image data through various display screens (which will be described later) by information acquired in this way. At this time, the graphics display signal preparation section 10 generates image data by index images recorded in the video disk recorder 8 as occasion demands to output the image data thus generated to the video mixing section 9. In this manner, the set-top box 1 can easily select a program desired by a user.

[0020]

A communication control section 15 accesses a predetermined accounting center through a telephone line with respect to a program necessary for accounting (charging) processing under control by the internal control section 4 to execute processing of necessary data exchange. In this manner, a program of a so-called paper view or the like can be watched and heard by the set-top box 1.

[0021]

An operation control section 16 receives an infrared remote control signal transmitted from a remote commander 18, and to detect an operation of an operation key provided on an operation panel of the set-top box 1 to send out a corresponding control signal to the internal control section 4.

[0020]

The internal control section 4 is a microcomputer which controls the operation of the set-top box 1 and also controls the operation of the video disk recorder 8 if necessary. This internal control section 4 executes a series of controls by executing control programs stored in a memory 19 as shown in FIG. 2.

[0023]

Namely, the memory 19 is composed of an area where the control programs are stored and an area of a data area as a work area for a central processing unit (CPU) 4A. The internal control section 4 executes the control programs by the central processing unit 4A to issue control commands to each of circuit blocks through an I/O control section 4b as required, and to acquire various data from respective circuit blocks thus to control the entire operation.

[0024]

In these controls, the internal control section 4 acquires electronic program information outputted from the program information extraction section 5, detailed program information acquired from a server, program information obtained from a CD-ROM loaded at the video disk recorder 8, program information provided by optical disk, and information relating to programs recorded in the video disk recorder 8 with respect to all programs that can be provided through the monitor device 11 and the speaker 12 which are connected to the set-top box 1. The internal control section 4 further controls the operation of the graphics display signal preparation section 10 so as to display a menu screen based on program

information which synthetically systematizes these information.

[0025]

In the case of recording programs of digital satellite broadcasting or the like by the video disk recorder 8, program information acquired as described above are recorded together so that management of the programs recorded in the video disk recorder 8 can be performed by the program information thus recorded.

[0026]

In this management of programs, the internal control section 4 unitarily performs management of these program information so that programs which can be provided by the set-top box 1 can be easily selected, and further receives a selection operation from user through a layered menu screen.

[0027]

Moreover, the internal control section 4 also records a history (past record) of programs watched and heard by a user who uses the set-top box 1, and controls the operation of the graphics display signal preparation section 10 such that a favorite channel of the user is displayed in a preferentially selectable manner in accordance with the history.

[0028]

In this manner, the set-top box 1 displays information of programs delivered by media such as broadcasting, an optical disk, and the like, on the screen, and thus constitutes an information providing apparatus which provides an

information screens as various information.

[0029]

#### (1-2) Structure of Remote Commander

FIG. 3 is a perspective view showing an outer appearance of the structure of a remote commander 18. This remote commander 18 is formed in a substantially rod-like shape. A window 18A for transmitting infrared rays is formed on the end surface of the front end side. In the remote commander 18, operation keys 18B such as ten-keys and the like are provided on the upper surface relative to the top end side, and a desired program can be selected by operation of these operation keys 18B.

[0030]

The upper surface of the remote commander 18 is lowered like a step drawing a smooth curve in the back end side behind the operation keys 18B such as ten-keys and the like, and the remote commander 18 can be gripped at this back end side by one hand. A button 18C having a relatively large diameter is disposed at a portion with which the thumb comes into when the remote commander 18 is gripped at the back end side with the thumb positioned upside. An operation key 18D for cancellation is displayed behind the button 18C.

[0031]

Here, the button 18C is an operation key for selection and determination and can switch the focus of an icon on the menu screen by operating the button



18C in the up, down, left, and right directions as indicated by arrows A to D. Also, a focused icon can be opened by performing pressing operation of this button as indicated by an arrow E. Thus, the button 18C is operated in the directions indicated by the arrows A to D and thereby functions as an operation key for making a selection. Therefore, in this case, the button 18C will be hereinafter called a selection operation key. Further, the button 18C is caused to undergo pressing operation as indicated by the arrow E so that it functions as an operation key for making a determination. In this case, the button 18C will be hereinafter called a determination operation key. In contrast, the operation key 18D for cancellation is an operation key for returning to a menu screen of a higher layer just above the layer of the screen being displayed.

[0032]

Further, the lower surface of the remote commander 18 is lowered like a step such that a forefinger hooks on the lowered step when the remote commander 18 is gripped with a thumb positioned upside. At the portion where the forefinger hooks, a press operation key (called a shift operation key hereinafter) 18E like a gun trigger is disposed. In this case, the shift operation key 18E is an operation key which serves to switch the display mode. In this set-top box 1, the display screen can be switched into a screen for program guide or a search screen by operating a predetermined operation key with the shift operation key 18E pressed.

[0033]

In this manner, in the set-top box 1, the remote commander 18 is gripped by one hand so that a desired program can be selected. Also, if necessary, the shift operation key 18E is caused to undergo pressing operation with the remote commander 18 gripped by one hand so that the display screen can thus be switched.

[0034]

FIG. 4 is a block diagram showing the remote commander 18. The remote commander 18 detects operations of the operation keys 18B, 18C, 18D, and 18E by a central processing unit (CPU) 18G through a predetermined interface, and drives a transmission section 18H on the basis of the detection result, thereby to transmit an infrared remote control signal. At this time, when other operation keys 18C and 18D are operated with the shift operation key 18E pressed, the central processing unit 18G inserts a remote control signal indicating that the other operation keys 18C and 18D are operated at a predetermined period, and sends sequentially a remote control signal indicating pressing operation on the shift operation key 18E. In this manner, a remote control signal is outputted such that the set-top box 1 can detect that these operation keys are simultaneously operated at the set-top box 1 side.

[0035]

### (1-3) Layered Display of Menu Screen

FIG. 5 is a plane view showing a main menu screen which is displayed on

the monitor device 11 by the set-top box 1. When the set-top box 1 is started to operate or in response to an operation on the menu screen in a lower layer below the main menu screen, the internal control section 4 displays the main menu screen. Although each icon is formed with a figure and a text included therein so that the contents of icons can be grasped by visual observation, the figures and texts will be partially omitted from the icons shown in the drawings.

[0036]

In this case, the main menu screen is constructed by a menu of recommended channels (Recommended), a menu of categories (Categories), and a menu of media (Media), each displaying nine icons. The menu of recommended channels (Recommended) is an icon for selecting the menu screen of recommended channels. These recommended channels are virtual channels to which channels that are selected with higher frequencies being assigned among channels that are receivable through the tuner 2, with the past record used as a reference.

[0037]

In contrast, the menu of categories (Categories) is an icon for opening a menu screen which is classified by categories, and the menu screen classified by the categories is a menu screen for opening programs (including programs recorded in the video disk recorder 8 in addition to the program being broadcasted) which can be watched and heard by the set-top box 1, respectively for the

categories. Also, the menu of media (Media) is an icon for opening a menu screen for selecting media which can be watched and heard by the set-top box 1.

[0038]

As a result of this, each menu on the main menu screen is arranged so as to construct an icon for opening a menu screen of a lower layer. A title indicating a menu screen, a channel, or the like presently focused is displayed at an upper portion on each display screen including the main menu screen, and an operation guide, a detailed commentary, or the like is displayed at a lower portion of the screen.

[0039]

The internal control section 4 controls the graphics display signal preparation section 10 to display the menu of categories (Categories) at the center of the main menu and the menus of recommended channels (Recommended) and media (Media) at the left and right sides of the menu of the categories, respectively, in an initial state immediately after the power is turned on. Further, the internal control section 4 displays a frame-like mark W (hereinafter called a mark of focus) so as to surround the menu of categories (Categories) at the center in the initial state, and notifies the user that the menu (Categories) at the center is presently focused, by the mark W. It is to be noted that an arrow indicating the direction in which the selection operation key 18C can be operated is displayed together with the focus mark W. Thus, convenience of use for user can be improved.

[0040]

Further, in response to operation of the selection operation key 18C of the remote commander 18 in the left and right directions, the internal control section 4 scrolls leftward and rightward the entire of the main menu screen including the menu of recommended channels (Recommended), the menu of categories (Categories), and the menu of media (Media) with the focus mark W displayed at the screen center. In this manner, the internal control section 4 switches the focused menu in response to an operation of this selection operation key 18C in the left and right directions. In the case where the display is switched from a menu screen of a lower layer into the main menu screen, the internal control section 4 displays the main menu screen, focusing the menu corresponding to the previous menu screen immediately before the switching.

[0041]

Thus, in the present embodiment, the internal control section 4 forms a fixed focus area at the screen center on the menu screen, and scrolls the entire of the menu screen by operation of the operation key 18C to display an icon of a focus in the focus area. In this manner, in the set-top box 1, movements of the view point are reduced so that the icon selected by user can be confirmed easily.

[0042]

On the other hand, FIG. 6 shows a schematic diagram which explains the relationship between the main menu screen and menu screens of lower layers with

respect to the menu of recommended channels (Recommended). When the determination operation key 18C is caused to undergo pressing operation with the menu of recommended channels (Recommended) focused, the internal control section 4 serves to open the menu screen of recommended channels. Further, when the determination operation key 18C is pressed down with the menu screen of recommended channels displayed, a program of the lowermost layer is displayed with respect to a channel selected by the menu screen of recommended channels. Inversely, when the cancellation operation key 18D is pressed down, the display is switched into menu screens of upper layers sequentially.

[0043]

In contrast, when the shift operation key 18E and the determination operation key 18C are caused to undergo simultaneously pressing operation with the menu screen of recommended channels displayed, the display screen is switched into a program guide with respect to a focused recommended channel. Further, when the cancellation operation key 18D is pressed down on the display screen of this program guide, the display screen returns to the original menu screen of recommended channels. Thus, in the this embodiment, in the case where the shift operation key 18E and the determination operation key 18C are operated together, a screen different from that in the case where merely the determination operation key 18C is operated is displayed.

[0044]

FIG. 7 is a plane view showing a menu screen of recommended channels, as a menu screen of a lower layer of the menu of recommended channels (Recommended). The internal control section 4 displays eight icons and one child screen in correspondence with the number of recommended channels displayed on the main menu screen, on the menu screen of the recommended channels. The internal control section 4 displays, on the initial screen, icons and child screen of upper nine channels of the highest selection frequency based on the past record. Namely, the internal control section 4 serves to arrange a child screen at the center of the menu screen and to display a program assigned to the virtual channel of the fifth channel as a center channel. In addition, in a manner to surround this center channel, icons of first to fourth channels (1ch to 4ch) and icons of sixth to ninth channels (6ch to 9ch) are displayed.

[0045]

In switching display of the menu screen of the recommended channels, the internal control section 4 controls operation of the graphics display signal preparation section 10 so as to switch the display with a predetermined transit screen inserted (put) between screens subject to switching. Namely, as indicated by the arrow F in FIG. 8, the focused menu is gradually enlarged with the focus mark W kept displayed (FIG. 8(A) and FIG. 8(B)). When this menu is enlarged until there results final size of the initial screen the icon of the fifth channel at the screen center is surrounded by the focus mark W.

[0046]

Thus, the internal control section 4 serves to shift the display screen so as to zoom in onto the icon selected by user. Subsequently, as indicated by an arrow G, the icon of the fifth channel (5ch) surrounded by the focus mark W is gradually enlarged (FIG. 8(C)). Then, the video mixing section 9 is instructed of cross-fade processing so that the display of the icon is gradually switched into display of a program assigned to the fifth channel (5ch) as display of the icon is enlarged.

[0047]

Thus, the internal control section 4 finally sets the menu screen of the recommended channels to the display as described above with reference to FIG. 7.

[0048]

In contrast, when the user operates the selection operation key 18C with the menu screen of recommended channels displayed, the entire menu screen is scrolled as indicated by an arrow H (FIG. 9(A)), with the focus mark W maintained at the screen center in response to the above-mentioned operation to switch the icon surrounded by the frame-shaped mark W. At this time, the display in the focus mark W has been surrounded so that child screen of a program is assigned is gradually minified (contracted) and switched into display of an icon simultaneously with movement of the entire screen is moved. Subsequently, complementarily to this minified display, the display of the icon surrounded by the focus mark W is enlarged gradually, and the icon of the enlarged display is



switched into a child screen of a program by cross-fading (FIGS. 9(B) and 9(C)).

[0049]

On the menu screen of recommended channels thus displayed, the internal control section 4 accepts a selection operation of virtual channels from the user through operation of the selection operation key 18C. When the determination operation key 18C is pressed down, the display is switched to a focused program. In this case, as shown in FIG. 10, the child screen focused at the screen center is displayed in an enlarged manner gradually (FIGS. 10(A) to 10(D)) on the menu screen, and the display of this child screen is finally enlarged over the entire display screen. Thus, the internal control section 4 can select a program presently broadcasted by selection operation on the menu screen of virtual channels.

[0050]

In contrast, when the cancellation operation key 18D is operated with the selected program thus displayed, the display screen is gradually minified to switch the display so as to zoom out onto the original menu screen in a manner opposite to the above explanation. At this time, the internal control section 4 serves to zoom out onto the menu screen such that the icon corresponding to the program which has been displayed until now is surrounded by the focus mark W. Thus, in the set-top box 1, even in the case of transiting to a menu screen of an upper layer, the icon which has been focused until now can be easily confirmed.

[0051]

Moreover, when user performs pressing operation of the cancellation operation key 18C with the menu screen of recommended channels displayed, the internal control section 4 serves to gradually minify (contract) the display screen and switch the display so as to zoom out onto the original main menu screen in a manner opposite to the above explanation. Also in this case, the internal control section 4 zooms out onto the main menu screen such that the menu of recommended channels which has been selected until now is surrounded by the focus mark W at the screen center.

[0052]

FIG. 11 is a plane view showing the screen of a program guide which has been explained above with reference to FIG. 6. This program guide is prepared by arranging guides each of which shows a start time of broadcasting of a program and contents of the program, sequentially from upside. Further, the guides are displayed in different text colors respectively for different categories. Thus, genres of programs can be confirmed or recognized visually with ease.

[0053]

FIG. 12 is a schematic diagram showing the relationship between the main menu screen and menu screens of lower layers with respect to the menu of categories (Categories) on the main menu screen. When the determination operation key 18C is pressed down with the menu screen of the categories focused, the internal control section 4 serves to open the menu screen of categories.

Further, when the determination operation key 18C is caused to undergo pressing operation with this menu screen of categories displayed, the internal control section 4 serves to shift the display to a menu screen of lower layer with respect to the category which has been selected on the menu screen of categories. Further, when the determination operation key 18C is caused to undergo pressing operation on the menu screen of this lower layer, the internal control section 4 switches the display into a focused program.

[0054]

On the contrary to the above, when the cancellation operation key 18D is caused to undergo pressing operation, the display is switched into menu screens of upper layers sequentially.

[0055]

Further, when the shift operation key 18E and the determination operation key 18C are caused to undergo switching operation simultaneously with the menu screen of categories displayed, the display screen is switched into a program guide relating to a focused category. Further, when the cancellation operation key 18D is caused to undergo pressing operation on the display screen of the program guide, the display screen returns to the original menu screen of categories. Thus, in this embodiment, in the case where the shift operation key 18E and the determination operation key 18C are operated together, a screen different from that in the case where the determination operation key 18C merely caused to undergo pressing

operation is displayed.

[0056]

FIG. 13 is a plane view showing the menu screen of categories. The internal control section 4 displays nine icons on this menu screen. Here, the internal control section 4 classifies programs, which can be provided by the set-top box 1, into nine categories depending on program information. The menu screen of categories is constructed by nine icons of sports, films, news, hobby, music, education, and the like which indicate these categories. On the menu screen, the icon focused at the center of the menu screen is displayed in an enlarged manner.

[0057]

The internal control section 4 serves to switch the display into the menu screen of categories, from the main menu screen similarly to the case of switching the display into the menu screen of recommended channels from the main menu screen. Namely, the internal control section 4 serves to switch the display with a transit screen inserted (put) therebetween. On the transit screen, the menu of categories is gradually enlarged such that the display zooms in onto this transit screen, and the icon surrounded by the focus mark W in the center is gradually enlarged (cf. FIG. 8).

[0058]

In contrast, when the user operates the selection operation key 18C with the menu screen of categories displayed, the entire menu screen is scrolled with the

focus mark W maintained at the center of the screen, and the focus is switched into the icon surrounded by the focus mark W similarly to the case of the menu screen of recommended channels (cf. FIG. 9). At this time, display of the icon which has been displayed in an enlarged manner in the state surrounded by the focus mark W up to that time is gradually minified (contracted) simultaneously with movement of the entire screen, and display of the icon surrounded by the focus mark W is subsequently gradually enlarged.

[0059]

FIG. 14 is a plane view showing the relationship between the menu screen of program selection of lower layer corresponding to one icon on the menu screen of categories and all icons grouped into this lower layer. Here, in the present embodiment, the internal control section 4 displays a menu of programs which can be provided, e.g., with respect to one genre arranged on the menu screen of categories, on the menu screen of the lower layer. At this time, for example, in the case where nine kinds of programs or more can be provided with respect to the music genre corresponding to one icon arranged on the menu of categories, the internal control section 4 serves to respectively assign icons to all of these programs which can be provided, to form an entire screen on which all of these icons are arranged.

[0060]

The internal control section 4 serves to zoom in a part of the entire screen

to display nine icons to prepare the menu screen of program selection by display of these nine icons. Further, at this time, with respect to the icon at the screen center, the program as the contents of this icon is displayed in form of a child screen.

[0061]

In switching the display from the menu screen of categories into the menu screen of program selection, the internal control section 4 controls the operation of the graphics display signal preparation section 10 so as to switch the display with a predetermined transit screen inserted (put) therebetween. Namely, as shown in FIGS. 15 and 16, the focused menu is gradually enlarged with the focus mark W kept displayed (FIGS. 15(A) and 15(B)). When this menu becomes larger than a predetermined value, display of this icon is rendered gradually transparent so that icons of lower layer can be viewed with eyes.

[0062]

Subsequently, the internal control section 4 displays the entire screen described above with reference to FIG. 14 (cf. FIG. 15(C)), and gradually enlarges the entire screen to display the menu screen of program selection (FIGS. 16(A) and 16(B)). Thus, in the set-top box 1, the entire image of icons which belong to the menu screen of program selection can be grasped visually.

[0063]

Further, at this time, the icon surrounded by the focus mark W at the center is gradually enlarged, and the display of this icon is switched into a child screen

when the icon becomes equal to a predetermined value or more (FIG. 16(B)).

[0064]

In contrast, when the user operates the selection operation key 18C with the menu screen of program selection displayed, the entire menu screen (the entire screen where all icons are displayed in this case) is scrolled similarly to the case of the menu screen of recommended channels (cf. FIG. 9), and the focus is switched into the icon surrounded by the focus mark W. At this time, display of the child screen which has been displayed in an enlarged manner up to that time in the state surrounded by the focus mark W is switched into display of an icon so that it is gradually minified (contracted) simultaneously with movement of the entire screen. Subsequently, the display of the icon surrounded by the focus mark W is gradually enlarged to switch display screen into display of a child screen.

[0065]

Moreover, when the determination operation key 18C is caused to undergo on the menu screen of program selection thus displayed, the internal control section 4 switches the display into a focused program. In this case, on the menu screen of program selection, the child screen focused at the screen center is gradually enlarged and displayed (cf. FIG. 10), and the display of this child screen is finally enlarged over the entire display screen.

[0066]

In contrast, when the cancellation operation key 18C is operated with the

selected program thus displayed, the display screen is gradually minified or contracted to switch display so as to zoom out onto the original menu screen of program selection in a manner opposite to the above explanation. At this time, the internal control section 4 serves to zoom out onto the menu screen such that the icon corresponding to the program which has been displayed up to that time is surrounded by the focus mark W at the screen center.

[0067]

Moreover, when the user performs pressing operation of the cancellation operation key 18C with the menu screen of program selection displayed, the internal control section 4 serves to minify gradually the display screen to switch the display so as to zoom out onto the original menu screen of categories in a manner opposite to the above explanation. At this time, in the manner opposite to the case explained above with reference to FIGS. 15 and 16, the internal control section 4 zooms out from the entire display until the entire screen based on the icon which has been focused up to that time is displayed in zoom out operation. Thereafter, the internal control section 4 switches into the icon of the corresponding category to zoom out from the icon of this category.

[0068]

Also in this case, the internal control section 4 zooms out onto the menu screen of categories such that the icon of the category which has been selected up to that time is surrounded by the focus mark W at the screen center.



[0069]

Further, when the user performs pressing operation of the cancellation operation key 18C on this menu screen of categories, the display screen is gradually minified to switch display so as to zoom out onto the original main menu screen similarly in a manner opposite to the above explanation. Also in this case, the internal control section 4 serves to zoom out onto the main menu screen such that the menu of the category which has been selected up to that time is surrounded by the focus mark W at the screen center.

[0070]

FIG. 17 is a plane view showing a screen of a program guide which has been explained with reference to FIG. 12. This program guide is prepared by arranging guides each including a start time of broadcasting of a program and the contents of the program, sequentially from upside. It is to be noted that FIG. 17 shows the case where no external device is connected to the network and the case where only those programs which can be acquired through the tuner 2 from the set-top box 1 can be provided.

[0071]

FIG. 18 is a schematic diagram showing the relationship between the main menu screen and menu screens of lower layers with respect to the menu of media (Media) on the main menu screen. When the determination operation key 18C is caused to undergo pressing operation with the menu of media (Media) focused on

the main menu screen, the internal control section 4 serves to open the menu screen of media. Further, when a source in which programs are recorded is selected with the menu screen of media displayed, display is switched into the menu screen of program selection as a menu screen of a corresponding lower layer. Further, when the determination operation key 18C is caused to undergo pressing operation on this menu screen of program selection, the internal control section 4 switches the display into a focused program.

[0072]

On the contrary to the above, when the cancellation operation key 18D is pressed down, the display is switched into menu screens of upper layer in order.

[0073]

Further, when the shift operation key 18E is caused to undergo pressing operation with a program as the lowermost layer displayed, the operation mode is switched into the first search mode, and the display screen is switched into a corresponding first search screen. When pressing state of the shift operation key 18E is released, the display screen is switched into the screen of original program display.

[0074]

In contrast, when the determination operation key 18C is caused to undergo pressing operation with the shift operation key 18E pressed on the menu screen of program selection, the operation mode is switched into a second search mode, and

the display screen is switched into a corresponding second search screen. In the internal control section 4, when a specific menu such as retrieve or the like is selected on this menu screen of media, a display screen corresponding to aimed processing is displayed by display switching which is different from that of the layered structure which has been explained with reference to FIG. 18.

[0075]

FIG. 19 is a plane view showing the menu screen of media. The internal control section 4 displays nine icons on this menu screen. Namely, the internal control section 4 becomes operative such that an icon (Guide ROM) for opening a program guide using CD-ROM, an icon (Text Search) for opening a program search based on text search, and an icon (Promotion) for opening a channel of promotion based on digital satellite broadcasting are arranged from the top of the left end. In the case where any of these three icons is selected, the internal control section 4 executes corresponding processing by switching into a display screen different from menu screens based on the layered structure as described above with reference to FIG. 17.

[0076]

Moreover, icons for respectively specifying a digital video disk (DVD), a hard disk device (HDD), and a compact disk player (CD) are arranged from the top of the center. From the top side of the right end, icons for specifying D-VHS, DVD-R, and VHS are arranged in order. The internal control section 4 display, in

an enlarged manner, the focused icon at the center of the menu screen also in this case. Thus, the icons arranged at the center and the right side on the menu screen indicate various media such as the video disk recorder 8 described above with reference to FIG. 1 and the like, which can be connected to the set-top box 1 through the home network.

[0077]

The internal control section 4 switches the display screen into the menu screen of media from the main menu screen in a manner similar to the case where the display is switched from the main menu screen into the menu screen of recommended channels. Namely, the internal control section 4 switches the display with a transit screen inserted therebetween. On the transit screen, the menu of media is gradually enlarged such that the display zooms in onto this menu of media, and the control icon surrounded by the focus mark W in the center is gradually enlarged (cf. FIG. 8).

[0078]

In contrast, when the user operates the selection operation key 18C with the menu screen of media displayed, the entire menu screen is scrolled with the focus mark W maintained at the center of the screen, and the focus is switched into the icon surrounded by the focus mark W similarly to the case of the menu of recommended channels (cf. FIG. 9). At this time, the display of the icon which has been displayed in an enlargement manner in the state surrounded by the

frame-shaped focus mark W is gradually minified simultaneously with movement of the entire screen shifts. Subsequently, the display of the icon surrounded by the focus mark W is gradually enlarged.

[0079]

FIG. 20 is a plane view showing a menu screen of program selection of a lower layer corresponding to one icon on the menu screen of media. The internal control section 4 serves to layout, for example, index images at the start times of respective programs among index images added during recording to form or prepare the menu screen of program selection. For example, with respect to a program selection menu based on a DVD or the like which is a reproduction-only medium, an index image recorded on the DVD disk is displayed, and if necessary, a leading (beginning) part is reproduced to form or prepare the menu screen.

[0080]

At this time, for example, it can be considered that nine programs or more are recorded in the hard disk device. Therefore, the internal control section 4 serves to assign icons respectively to all the programs which are grouped into the icon of the hard disk device, and to create (form) the entire screen by arranging all these icons.

[0081]

The internal control section 4 zooms in onto a part of the entire screen to display nine icons to prepare the menu screen of program selection by display of

the nine icons. At this time, with respect to the icon at the screen center, the program as the contents of this icon is displayed in form of a child screen.

[0082]

In switching the display from the menu screen of media into the menu screen of program selection, the internal control section 4 switches the display, with a transit screen similar to the transit screen described above with reference to FIGS. 15 and 16 being inserted therebetween. Namely, a focused menu is gradually enlarged with the focus mark W kept displayed. When this menu becomes equal to a predetermined value or more, the display of this icon is rendered gradually transparent so that icons of lower layers can be viewed with eyes. Subsequently, the internal control section 4 displays the entire screen based on all the icons and gradually enlarges the entire screen to display the menu screen of program selection. Further, at this time, the icon surrounded by the focus mark W at the center is gradually enlarged, and the display of this icon is switched into display of a child screen when the icon becomes equal to a predetermined value or more.

[0083]

In contrast, when user operates the selection operation key 18C with the menu screen of program selection displayed, the entire menu screen (the entire screen where all icons are displayed in this case) is scrolled, like in the case of the menu screen of recommended channels (cf. FIG. 9), and the focus is switched into

the icon surrounded by the focus mark W. At this time, display of the child screen which has been displayed in an enlarged manner in the state surrounded by the focus mark W is switched into display of an icon and is gradually minified simultaneously with movement of the entire screen. Subsequently, the display of the icon surrounded by the focus mark W is gradually enlarged and is switched into display of a child screen.

[0084]

Moreover, when the determination operation key 18C is caused to undergo pressing operation on the menu screen of program selection thus displayed, the internal control section 4 switches the display into a focused program. In this case, on the menu screen of program selection, the child screen focused at the screen center is gradually enlarged and is displayed (cf. FIG. 10), and the display of this child screen is finally enlarged over the entire display screen.

[0085]

In contrast, when the cancellation operation key 18C is operated with the selected program thus displayed, the display screen is gradually minified to switch display so as to zoom out onto the original menu screen of program selection in a manner opposite to the above explanation. At this time, the internal control section 4 serves to zoom out onto the menu screen such that the icon corresponding to the program which has been displayed up to that time is surrounded by the focus mark W at the screen center.

[0086]

Further, when the user presses the cancellation operation key 18C with the menu screen of program selection displayed, the internal control section 4 serves to contract gradually the display screen to switch the display so as to zoom out onto the original menu screen of media in a manner opposite to the above explanation. At this time, the internal control section 4 serves to zoom out from the entire display until the entire screen based on the icon which has been focused up to that time is displayed. Thereafter, the internal control section 4 switches the display into the icon of the corresponding medium to zoom out from the icon of this medium. Also in this case, the internal control section 4 serves to zoom out onto the menu screen of media such that the icon of the medium which has been selected up to that time is surrounded by the focus mark W at the screen center.

[0087]

Further, when the user performs pressing operation of the cancellation operation key 18C on this menu screen of media, the display screen is gradually minified to switch display so as to zoom out onto the original main menu screen similarly in a manner opposite to the above explanation. Also in this case, the internal control section 4 serves to zoom out onto the main menu screen such that the menu of the medium which has been selected until now is surrounded by the focus mark W at the screen center.

[0088]



(1-4) Processing Procedure Internal Control Section 4 in Layered Display

FIGS. 21 and 22 are flowcharts showing a processing procedure of the internal control section 4 in case of switching the menu screens, etc. by zooming processing based on such enlargement/contraction of icons. In this processing procedure, processing by the internal control section 4 shifts from step SP1 to step SP2 to select corresponding icons from selection used for display and to determine the layout of the selected icons, etc.

[0089]

Subsequently, processing by the internal control section 4 shifts to step SP3 to display the entire screen based on all corresponding icons at this step. Thereafter, at the subsequent step SP4, an aimed (target) menu screen is displayed. At this time, the internal control section 4 displays the menu screen so as to zoom in from the entire screen. Thus, in the case where displayed icons are limited and the entire screen is equal to the menu screen, e.g., as in the case of the main menu screen, the internal control section 4 displays directly the menu screen.

[0090]

Subsequently, processing by the internal control section 4 shifts to step SP5 to display, in an enlarged manner, a focused icon at the screen center. In this case, on the menu screen of program selection as the lowermost layer, a child screen is assigned to the enlarged display thus obtained.

[0091]

Subsequently, processing by the internal control section 4 shifts to step SP6 to judge whether or not the selection operation key (selection key) 18C is operated. When affirmative result is obtained, processing by the internal control section 4 shifts to step SP7 to contract (minify) the icon at the screen center. Subsequently, processing by the internal control section 4 shifts to step SP8 to scroll the menu screen to switch the focus to subsequently return to the step SP5 to display, in an enlarged manner, the newly focused icon.

[0092]

On the contrary, in the case where the selection operation key (selection key) 18C is not operated by any means, processing by the internal control section 4 shifts to step SP9 from the step SP6 (FIG. 22). Here, the internal control section 4 serves to judge whether or not the determination operation key (determination key) 18C is caused to undergo pressing operation. When denial result is obtained, processing by the internal control section 4 shifts to the step SP10. At this step, the internal control section 4 serves to judge whether or not the cancellation operation key (cancel key) 18D is operated. When denial result is obtained, processing by the internal control section 4 returns to the step SP6.

[0093]

In this manner, the internal control section 4 repeats the processing procedure of the step SP6 to SP9 to SP10 to SP6 for a time period during which the determination operation key 18C, the cancellation operation key 18D, and the

selection operation key 18C are operated.

[0094]

When the determination operation key 18C is operated while the processing procedure is repeated in this way, affirmative result is obtained at the step SP9. Thus, processing by the internal control section 4 shifts from the step SP9 to step SP11. At this step, the internal control section 4 serves to judge whether or not the image at the screen center is an image linked to a program, i.e., whether or not the image at the screen center is a child screen for introducing a program.

[0095]

In the case where the menu screen being displayed is a menu screen except for the menu screen of program selection, denial result is obtained. Thus, processing by the internal control section 4 shifts from the step SP11 to step SP12 to zoom in onto the icon at the screen center so as to switch display screen into menu screen of lower layer thereafter to return to the step SP2. In this manner, the internal control section 4 switches the menu screen to those of lower layers sequentially, in response to operation of the determination operation key 18C.

[0096]

In contrast, in case where the menu screen being displayed is a menu screen of program selection, affirmative result is obtained at the step SP11. In this case, processing by the internal control section 4 shifts from the step SP11 to the

step SP13. At this step, the internal control section 4 switches the entire operation so as to display program based on the child screen over the entire display screen. In this manner, the internal control section 4 displays programs selected by the user in a manner routing the layers sequentially.

[0097]

Subsequently, processing by the internal control section 4 shifts to the step SP14 to judge whether or not the cancellation operation key 18D is operated. When denial result is obtained, the internal control section 4 repeats the step SP14. In this manner, the internal control section 4 continues display of programs until the cancellation operation key 18D is operated.

[0098]

In contrast, when the cancellation operation key 18D is operated during display of program, processing by the internal control section 4 shifts from the step SP14 to step SP15 to switch, at this step, display so as to zoom out onto the menu screen of program selection as the menu screen immediately before thereafter to return to the step SP4. In this manner, the internal control section 4 can switch the channel being watched and heard, etc. as required.

[0099]

In cases where screen display returns to the menu screen of program selection in this way and/or in the case where the menu screen or the like is erroneously selected, processing by the internal control section 4 shifts from the

step SP10 to the step SP16 by operation of the cancellation operation key 18D. At this step, the internal control section 4 serves to judge whether or not a menu screen of an upper layer exists with respect to the menu screen being displayed. In the case where it is judged at this step that the main menu screen is displayed, denial result is obtained. Thus, processing by the internal control section 4 returns from the step SP16 to the step SP6.

[0100]

In contrast, in the case where there is an upper layer, when affirmative result is obtained at the step SP16, processing by the internal control section 4 shifts from the step SP16 to step SP17 to switch the display so as to zoom out onto a menu screen of an upper layer. Further, at the subsequent step SP18, the internal control section 4 selects an icon from choices with respect to the menu screen of the upper layer to determine the layout, etc. Then, processing by the section 4 returns to the step SP4.

[0101]

#### (1-5) Display of Search Screen

FIG. 23 is a plan view showing a first search screen in case where the shift operation key 18E is caused to undergo pressing operation in the state where a program is displayed. The internal control section 4 displays this display screen in case where a medium whose program is displayed is a random-accessible hard disk device or the like.

[0102]

On this first search screen, the internal control section 4 displays, in a contracted manner, at the screen center, a program which has been displayed over the entire screen up to that time. Further, at the lower side of the screen, index images of the program are displayed in the state arranged in the time-series order from the left side. At this time, the internal control section 4 displays an index image (i.e., a focused index image) corresponding to the image being displayed at the screen center in an enlarged manner as compared to other still images and positioned at the center of the lower side.

[0103]

Further, when the selection operation key 18C is operated in the state where the shift operation key 18E is caused to undergo continuously pressing operation, still image positioned at the lower side is moved in the left and right directions in response to this operation. At this time, with movement of image, the focus is switched into the still image displayed at the central portion of the lower side to judge the focused index image, and to switch the index image which has been enlarged into an index image having a size equal into the size of other images.

[0104]

On the other hand, when the determination operation key 18C is caused to undergo pressing operation in the state where the shift operation key 18E is caused to undergo continuously pressing operation, the display image at the screen center

is switched so as to correspond to the focused index image.

[0105]

In contrast, when pressing operation of the shift operation key 18E is released, the internal control section 4 wholly displays screen displayed at the screen center. Then, display screen returns to the digital display screen. In this manner, in the set-top box 1, for a time period during which the shift operation key 18E is caused to undergo pressing operation, the first search screen is displayed so that a desired scene can be selected as if fast feed and rewind were performed in a video tape recorder. Further, processing corresponding to the fast feed and rewind can be momentarily executed.

[0106]

Thus, in executing these processing, the internal control section 4 switches control commands to be issued to the hard disk device or the like as occasion demands to thereby deliver index images necessary for forming this search screen to the graphics display signal preparation section 10.

[0107]

In contrast, FIG. 24 is a plane view showing a first search screen displayed in case where the medium is a video tape recorder or the like which is difficult to access randomly. In this case, it is difficult to find heads of programs by random access with ease. For this reason, the internal control section 4 displays icons similar to operation keys of the video tape recorder, in place of still images in time

series.

[0108]

Further, when the selection operation key 18C is operated in the state where the shift operation key 18E is caused to undergo continuously pressing operation, the brightness of these icons is switched in response to this operation, so that the icon of the focus can be viewed with eyes. Further, when the determination operation key 18C is caused to undergo pressing operation in the state where the shift operation key 18E is caused to undergo continuously pressing operation, the internal control section 4 outputs a control command for fast feed, or rewind, etc. to a video tape recorder or the like, in correspondence with the focused icon to display reproduction image thus obtained at the screen center.

[0109]

In contrast, when the pressing state of the shift operation key 18E is released, the internal control section 4 displays, over the entire screen, the internal control section 4 displays the screen which has been displayed at the screen center. Then screen display returns to the original display screen.

[0110]

In contrast, FIG. 25 is a plane view showing a second search screen in the case where the shift operation key 18E and the determination operation key 18C are simultaneously operated in the state where the menu screen of program selection in a medium is displayed. The internal control section 4 displays this



display screen in the case where the medium being displayed in the form of a child screen is a medium such as a hard disk device or the like which is randomly accessible.

[0111]

Here, on the second search screen, the top index image of a program being focused is displayed at the lower side of the screen center in the state surrounded by the focus mark W. Further, index images relating to the focused program are displayed while being sequentially contracted in a direction sequentially along the time axis, spirally toward the center of the display screen, in the counterclockwise direction from this index image. Further, the display is gradually faded out toward the center of the spiral from the outer circumferential side so that the background is seen through.

[0112]

On the contrary, in the clockwise direction of the focused index image, an index image at a time point earlier than the index image being focused is displayed in correspondence with the size of the display which sequentially changes along the spiral layout of index images. This index image is also displayed to be faded such that the background can be seen through. In this respect, in FIG. 25, since the index image being focused is the head of a program, a meshed dummy index image is displayed in the display area of the index image at a time point earlier than the index image being focused.

[0113]

Further, the second search screen is displayed on the background where the index images radially spread over from the center of the spiral layout. In this manner, in this set-top box 1, by layout along the time axis utilizing the perspective, the flow of the program which changes in accordance with elapse of time can be visually grasped with the focused index image being as reference so that a desired scene can be selected easily.

[0014]

Namely, as shown in FIGS. 26, when the selection operation key 18E is operated in the rightward direction, the internal control section 4 moves, as shown in FIG. 26(A) in contrast to FIG. 26(B), with the focus mark W maintained at the present display position, in response to the above-mentioned operation, the display position of each index image to a display position which is shifted to the past side by one step equivalent to one screen in the clockwise direction. Further, in this movement, each index image is changed into a size corresponding to the position after the movement (It is to be noted that images may be arranged such that image is older as the image is closer to the inside of the spiral layout so that the display position of each index image is moved in the clockwise direction to a display position which is shifted to the future side by one step equivalent to one screen). Further, the internal control section 4 serves to arrange a subsequent future index image at the innermost circumferential index image layout position where an index

image is lost by the movement. Further, the internal control section 4 sets the focus at the index image moved into the focus mark W. Thus, the focused index image is switched in the time-axis direction.

[0115]

On the contrary to the above, when the selection operation key 18C is operated in the leftward direction, the display position of each index image is moved, as shown in FIG. 26(C) in contrast to FIG. 26(B), in the counterclockwise direction, to a display position at the future side by one step equivalent to one screen in response to this operation with the focus mark W maintained at the present display position. Further, during this movement, each index image is changed into a size corresponding to the position after the movement (It is to be noted that images may be arranged such that image is older as the image is closer to the inside of the spiral layout so that the display position of each index image is moved in the counterclockwise direction to a display position which is shifted to the past side by one step equivalent to one screen). Moreover, the internal control section 4 serves to arrange the subsequent index image at the outermost circumferential side index image layout position where an index image is lost by the movement. At the same time, the internal control section 4 switches the focus into the index image moved into the focus mark W. Thus, in this manner, the focused index image is switched in a direction opposite to the time axis.

[0116]

In contrast, when the selection operation key 18C is operated upward, each of the index images arranged in the spiral layout is moved, as shown in FIG. 27(A) in contrast to FIG. 27(B), to a display position shifted toward the outer circumferential side of the spiral, in response to this operation, with the focus mark W maintained at the present display position. Further, during this movement, each index image is changed into size corresponding to the position after the movement. Further, subsequent index images are sequentially arranged at index image layout position at the inner circumferential side where the index image is lost by this movement. At the same time, the internal control section 4 switches the focus into the index image moved into the focus mark W. Thus, the index image is switched in the time-axis direction. In this manner, the internal control section 4 switches the display of the search screen as if the view point was moved to the back side by one turn along the center axis of the spiral layout with respect to the index images arranged spirally from the front side, and jumps over index images equivalent to one turn of the spiral layout to switch the focused index image in the direction along the time axis.

[0117]

In contrast, when the selection operation key 18C is operated downward, each of the index images arranged in the spiral layout is moved as shown in FIG. 27(C) in contrast to FIG. 27(B) to a display position shifted toward the inner circumferential side of the spiral, in response to this operation, with the focus mark

W maintained at the present display position. Further, during this movement, each index image is changed into a size corresponding to the position after the movement. Further, subsequent index images are sequentially arranged at an index image layout position of the outer circumferential side where the index image is lost by this movement. At the same time, the internal control section 4 switches the focus into the index image moved into the focus mark W. Thus, the index image is switched in the direction opposite to the time-axis direction. In this manner, the internal control section 4 switches the display of the search screen as if the view point was moved to the front side by one turn along the center axis of the spiral layout, with respect to the index images arranged spirally from the front side, and jumps over index images equivalent to one turn of the spiral layout to switch the focused index image in the direction opposite to the time axis direction.

[0118]

In contrast, when the determination operation key 18C is caused to undergo pressing operation, the internal control section 4 displays the focused index image over the entire screen to start reproduction of a recorded video (image) from the index image.

[0119]

Further, in the case where display of a program is thus started through the second search screen, when the determination operation key 18C is operated during display of the program, the internal control section 4 switches the display

into the second search screen to display index images in the same manner as described above.

[0120]

In contrast, when the cancellation operation key 18D is operated with the second search screen displayed, the screen display returns to the original menu screen of program selection.

[0121]

(1-6) Processing Procedure of Internal Control Section 4 in Display of Search Screen and Retrieve Screen

FIG. 28 is a flowchart showing the processing procedure of the internal control section 4 in the display of the search screen and the display of the retrieve screen, with the operation of the shift operation key 18E used as a standard. When the power is turned on, processing by the internal control section 4 shifts from step SP20 to step SP21 to judge whether or not the shift operation key 18E (shift key) is caused to undergo pressing operation. In the case where the shift operation key 18E is not caused to undergo pressing operation, processing by the internal control section 4 shifts to step SP22 to switch the operation into ordinary screen display mode which has been described above with respect to the layered display of menu screens.

[0122]

Subsequently, processing by the internal control section 4 shifts to step

SP23 to judge whether or not another operation key is operated. If no other operation key is operated, processing by the section 4 returns to the step SP21. In contrast, in the case where any other operation key is operated, processing by the internal control section 4 shifts to step SP24 to switch the display into an upper layer, or a lower layer, etc. in response to the operation of the operation key. Thereafter, processing by the internal control section 4 returns to the step SP21.

[0123]

In contrast, in the case where the shift operation key 18E is caused to undergo pressing operation, affirmative result is obtained at the step SP21. Thus, processing by the internal control section 4 shifts to step SP25 to enter into a special screen display mode. Subsequently, processing by the internal control section 4 shifts to step SP26 to judge whether or not any other operation key is operated. In the case where no other operation key is operated, processing by the internal control section 4 returns to the step SP21. To the contrary, in the case where any other operation key is operated, processing by the internal control section 4 shifts to step SP27 to switch the display screen into a display screen of program guide or a search screen in response to the operation of the operation key. Thereafter, the internal control section 4 returns to the step SP21.

[0124]

In this manner, the internal control section 4 displays a screen different from the ordinary case only in the case where the shift operation key 18E is caused

to undergo pressing operation. As a result, various operations can be executed by a lesser number of operation keys accordingly. Thus, in case where a program is displayed, the first search screen is displayed for a time period during which the shift operation key 18E is caused to undergo pressing operation in this processing procedure.

[0125]

FIGS. 29 and 30 are flowcharts showing a processing procedure of the internal control section 4 in the first search screen. Processing by the internal control section 4 shifts from step SP40 to step SP41 to display a program selected by user over the entire screen of the monitor device 11 to shift to step SP42. At this step, the internal control section 4 serves to judge whether or not the shift operation key 18E is operated. When denial result is obtained, processing by the section 4 returns to the step SP41.

[0126]

In contrast, when affirmative result is obtained at the step SP42, processing by the internal control section 4 shifts to step SP43 to minify (contract) the display of moving picture as a program (cf. FIG. 23). Subsequently, processing by the internal control section 4 shifts to step SP44 to acquire position information (e.g., a time code or the like) with respect to the moving picture being reproduced thereafter to shift to step SP45 to acquire index images before and after the time information as a standard, from the video disk recorder 8 to display these index



images arranged at the lower side of the contracted moving picture.

[0127]

Subsequently, processing by the internal control section 4 shifts to step SP46 to judge whether or not processing operation of the shift operation key 18E is kept continuously performed. When denial result is obtained at this step, processing by the section 4 shifts to step SP47 to delete the index images from the display screen. At the subsequent step SP48, the internal control section 4 serves to restore the moving picture which has been displayed in a contracted manner into moving picture having the original size. Thus, processing by the internal control section 4 returns to the step SP42.

[0128]

In this manner, when the shift operation key 18E is caused to undergo pressing operation, the internal control section 4 displays the first search screen. When the pressing operation of the shift operation key 18E is released, the original display screen is displayed.

[0129]

In contrast, if the shift operation key 18E is kept continuously pressed, processing by the internal control section 4 shifts from the step SP46 to step SP49 (FIG. 30) to judge whether or not the selection operation key 18C is operated in addition to the shift operation key 18E. If affirmative result is obtained, the internal control section 4 shifts to a step SP50 to move the positions of the index

images to switch the focused index image, in response to the operation of the selection operation key 18C. The internal control section 4 then returns to the step SP46.

[0130]

In contrast, when denial determination result is obtained at the step SP49, processing by the internal control section 4 shifts to step SP51 to judge whether or not the determination operation key 18C is operated in addition to the shift operation key 18E. When denial result is obtained at this step, processing by the internal control section 4 returns to the step SP46. To the contrary, when affirmative result is obtained, processing by the internal control section 4 shifts to step SP52 to switch the display into a corresponding reproduction image, with respect to the scene of the focused index image. Then, processing by the internal control section 4 returns to the step SP46.

[0131]

As stated above, the internal control section 4 is adapted to operate the operation key 18C with the shift operation key 18E pressed, thus to have ability to watch and hear a program from a desired scene .

[0132]

FIGS. 31, 32, and 33 are flowcharts showing a processing procedure of the internal control section 4, which relate to the second search screen. In this processing procedure, a processing procedure when recording of a program is

performed is shown together. Namely, processing by the internal control section 4 shifts to step SP61 from step SP60 to select candidates of index images while recording, at the time of recording, image data provided sequentially through digital satellite broadcasting into the video disk recorder 8, for example. Further, at the subsequent step SP62, the internal control section 4 sets an index image for every scene from the selected candidates of index images to record the index image as a thumbnail image into the medium under picture recording.

[0133]

When the determination operation key 18C is operated on the program selection menu of media with the shift operation key 18E caused undergo pressing operation after picture recording of program is thus completed, processing by the internal control section 4 shifts to step SP63 to sets a count value (count) for designating an index image to 0 (zero). In addition, the number (max) of index images displayed on the screen is set to a maximum value which can be displayed on the second search screen.

[0134]

Subsequently, processing by the internal control section 4 shifts to step SP64 to acquire, from the video disk recorder 8, an index image expressed as a variable (max)-(count) from the top of the sequence of the focused program. Thereafter, processing by the internal control section 4 shifts to step SP65 to calculate the coordinates, size, transparency, and depth of this index image.

[00135]

At the subsequent step SP66, the internal control section 4 displays, on the display screen, the index image acquired in accordance with the calculation result. Thereafter, processing by the internal control section 4 shifts to step SP67 to increment the count value (count) by 1 (one). Subsequently, processing by the internal control section 4 shifts to step SP68 to judge whether or not the count value (count) is equal to a maximum value (max) which can be displayed or less on the second search screen. When affirmative result is obtained at this step, processing by the internal control section 4 shifts to the step SP64.

[00136]

As stated above, the internal control section 4 repeats a processing procedure of the steps SP64 to SP65 to SP66 to SP67 to SP68 to SP64 to arrange spirally the index images. Thereafter, processing by the internal control section 4 shifts to step SP70 (FIG. 32).

[0137]

The internal control section 4 serves to judges at the step SP 70 whether or not any operation key is operated. When denial result is obtained, internal control section 4 repeats the step SP70. In contrast, when any operation key is operated, affirmative result is obtained. Thus, processing by the internal control section 4 shifts to step SP71 from the step SP70 to judge at this step whether or not the determination operation key 18C is caused to undergo pressing operation. When

denial result is obtained at this step, processing by the internal control section 4 shifts to step SP72 to judge whether or not the selection operation key 18C is operated in the rightward or leftward direction.

[0138]

When affirmative result is obtained at this step, processing by the internal control section 4 shifts to step SP73 to move the spirally arranged index images in the spiral layout direction or a direction opposite thereto in correspondence with the operation direction of the operation key 18C. Simultaneously, the internal control section 4 changes the sizes of the index images (cf. FIG. 26). Then, processing by the internal control section returns to the step SP70.

[0139]

In contrast, when denial result is obtained at the step SP72, processing by the internal control section 4 shifts to step SP74 from the step SP72 to judge whether or not the selection operation key 18C is operated in the upward or lower direction.

[0140]

When affirmative result is obtained at this step, processing by the internal control section 4 shifts to step SP75 to move the spirally arranged index images toward the outer or inner circumferential side in correspondence with the operation direction of the operation key 18C to changes the sizes thereof (cf. FIG. 27). Then, processing by the internal control section 4 returns to the step SP70.

[0141]

In contrast, when denial result is obtained at the step SP74, processing by the internal control section 4 shifts to step SP76 to judge whether or not the cancellation operation key 17D is operated. When denial result is obtained at this step, processing by the internal control section 4 returns to the step SP70. To the contrary, when affirmative result is obtained, processing by the internal control section 4 shifts to step SP77 to switch the display screen into a menu screen of program selection (FIG. 20). Thereafter, processing by the internal control section returns to the step S70.

[0142]

In contrast, if the determination operation key 18C is caused to undergo pressing operation, processing by the internal control section 4 shifts to step SP78 from the step SP71 (FIG. 33). At this step, the internal control section 4 serves to enlarge the index image arranged at the current position, which is the position surrounded by the focus mark W, over the entire screen. Subsequently, processing by the internal control section 4 shifts to step SP79 to instruct the video disk recorder 8 to start reproduction from a scene specified by the index image, and to display a reproduction result thereof on the monitor device 11. As stated above, the set-top box 1 is adapted to visually grasp flow of time to have ability to easily select a desired scene.

[0143]

Subsequently, processing by the internal control section 4 shifts to step SP80 to judge whether or not the determination operation key 18C is caused to undergo pressing operation again. When denial result is obtained at this step, the internal control section 4 repeats the step SP80. In contrast, when affirmative result is obtained, processing by the internal control section 4 shifts to step SP81.

[0144]

At this step, the internal control section 4 serves to acquire, from the video disk recorder 8, an index image corresponding to the scene presently displayed, from the video disk recorder 8, and stops reproduction of moving picture by the video disk recorder 8 at the subsequent step SP82. Simultaneously, the internal control section 4 switches the display of the moving picture into the index image. Thereafter, processing by the internal control section 4 shifts to step SP83 to the gradually contract the index image to arrange the index image thus contracted at the current position on the second search screen. At this time, the internal control section 4 serves to simultaneously acquire, from the video disk recorder 8, preceding and succeeding index images necessary for the second search screen to arrange the index images thus acquired.

[0145]

When the second search screen is thus displayed, processing by the internal control section 4 returns to the step SP70 to wait for a subsequent operation. In this manner, the set-top box 1 can quickly return to the second search screen as

required in the case where a desired scene is obtained by the second search screen to watch and hear the desired scene thus acquired.

[0146]

Thus, in case where various programs which can be provided by the set-top box 1 are systemized to perform management by the main menu screen and the like, it is necessary to acquire program information which can be provided from the video disk recorder 8 or the like as an external equipment. Therefore, when the power is turned ON, when the power of another device is turned ON, or by a notification from the video disk recorder 8 whose recording medium is replaced, the internal control section 4 executes a processing procedure shown in FIG. 34 to acquire various program information necessary for systemized management as described above.

[0147]

Namely, processing by the internal control section 4 shifts to step SP91 from the step SP90 to judge presence or absence of an external equipment connected to the home network. This judgment is executed by sending a predetermined command to an IEEE1394 bus by broadcasting to monitor a response thereto. It is to be noted that when an external device is newly added, a bus reset takes place so that presence or absence of an external device may be determined at the time of bus reset.

[0148]



When denial result is obtained at this step, processing by the internal control section 4 shifts to step SP92 to complete this processing procedure. In contrast, When affirmative result is obtained, processing by the internal control section 4 shifts to step SP93. At this step, on the basis of response to the broadcasting operation, the internal control section 4 sequentially issuing control commands for devices sequentially to acquire responses thereto to thereby judge by attribute information of the equipment added to the response to the broadcasting whether or not the equipment connected to the home net work has electronic program information.

[0149]

When denial result is obtained at this step, processing by the internal control section 4 shifts to step SP92 to completes the processing procedure. In contrast, when affirmative result is obtained, processing by the internal control section 4 shifts to step SP94. The internal control section 4 issues a control command to the equip having electronic program information to acquire all electronic program information.

[0150]

In accordance with the electronic program information thus obtained, When menu of retrieve is selected by the above-described in accordance with the electronic program information thus acquired, when an icon (guide ROM) for opening a program guide using a CD-ROM assigned to the menu screen of a

medium, or when an icon (text retrieve) for opening a menu of program retrieve through text retrieve is selected, processing by the internal control section 4 then shifts to step SP95 to calculate a display position of the electronic program information on a corresponding display screen. At the subsequent step SP96, the internal control section 4 displays text information based on the electronic program information at this calculated position. Thereafter processing by the control section 4 shifts to the step SP92 to complete this processing procedure.

[0151]

In addition to this processing, the internal control section 4 activates the communication device 14 for every week to acquire detailed program information from a predetermined serve to thereby compensate program information provided by broadcasting waves.

[0152]

## (2) Operation of the Embodiments

In the structure described above, in the set-top box 1 (FIG. 1), when user selects viewing (watching/hearing) of program by digital satellite broadcasting or digital ground wave, a broadcasting wave obtained through the antenna 3 is selected by the tuner 2 so that a transport stream is demodulated. Thus, a desired channel is selected by this transport stream. Further, image data and audio data of this channel are outputted to the monitor device 11 and the speaker 12. Thus, a program desired by the user is provided.

[0153]

Moreover, when the user selects recording of this program, image data and audio data which are obtained through the video signal processing section 6 and the sound signal processing section 7 are outputted to the video disk recorder 8 through the home network, and are recorded by a hard disk device or an optical disk device as the video disk recorder 8.

[0154]

Moreover, program information of the program to be recorded is recorded together by electronic program information acquired by the broadcasting wave, detailed program information acquired from a predetermined server through a telephone line, detailed program information acquired from a CD-ROM loaded to the video disk recorder 8, and the like.

[0155]

Further, in case where recording is made onto a recording medium such as a hard disk device or the like which can be randomly accessed, the position of a scene change is detected from sequential image data, and a head image of each scene as the image of the scene change is contracted as a thumbnail image and is recorded together as an index image.

[0156]

Further, when the user thus selects viewing (watching/hearing) of a program recorded on the video disk recorder 8 or a program provided through a

recording medium selling on the market, image data and audio data obtained from the video disk recorder 8 are inputted to video signal processing section 6 and audio signal processing section 7 through the home network. Thus, the monitor device 11 and the speaker 12 are driven by the output signals from the video signal processing section 6 and the sound signal processing section 7. Also in this case, a program desired by the user can be provided.

[0157]

In case where the user thus watches and hears a program based on digital broadcasting or digital ground wave, or in the case where a program provided by the video disk recorder 8 is viewed (watched and heard), a menu screen is provided such that an aimed (target) program can be watched and heard easily and quickly by program information of each program in the set-top box 1.

[0158]

Namely, in the set-top box 1 (FIG. 34), when the power is turned on, when the power of another device is turned on, or by notification from the video disk recorder 8 whose recording medium is replaced, an external device connected to the home network is identified by the internal control section 4 (steps SP91 and SP93). On the basis of on this identification, program information added from the external device during recording is obtained, and further, with respect to a program such as a movie or the like provided by a reproduction-only recording medium, program information is acquired from this recording medium.

[0159]

Further, program information is acquired from electronic program information added to a broadcasting wave, and further, program information with respect to receivable programs and reproducible programs are acquired from program information provided from a special CD-ROM and program information provided from a predetermined server. In the set-top box 1, programs which can be provided are classified into categories such as movie music, and the like, depending on this program information.

[0160]

Moreover, in the set-top box 1, information of programs that the user watched and heard in the past are recorded. Favorite channels of the user are selected from broadcasting channels in accordance with the record, and the selected broadcasting channels are classified into first to ninth virtual channels in the order from the highest selection frequency.

[0161]

Thus, in accordance with the past history (record) and the program information, programs which can be provided by the set-top box 1 are classified. In the set-top box 1, when the power is turned ON, a menu in which classification based on media is added to the above-mentioned classification is displayed as a main menu screen (FIG. 5), and further, a desired program can be selected, following sequentially the layers by operation on the main menu screen.

[0162]

In this manner, in the set-top box 1, management of programs as information screens are unitarily performed to display a menu screen. Even in case where a number of programs can be provided by acquiring programs from a plurality of information sources, information can be selected, mainly based on the contents of information without becoming conscious of the information source. Accordingly, the user can select a desired program easily, rapidly, and accurately without being conscious about media, e.g. a video tape recorder, an optical disk, and the like. The convenience of use can be improved accordingly.

[0163]

Namely, for example, in the case where a user watches and hear digital satellite broadcasting or ground wave broadcasting, he selects the menu of recommended channels (Recommended) on the main menu screen and then goes down the layers sequentially (FIG. 6), so a program of a desired broadcasting channel can be watched and heard without being conscious about digital satellite broadcasting, ground wave broadcasting, or channels.

[0164]

In the case where user desires to watch and hear a program of music, movie, or the like, the user selects the menu of categories (Categories) on the menu screen and goes down the layers sequentially (FIG. 12). A list menu is then displayed with respect to a desired genre. By selecting an aimed (target) program from the

menu, a desired program can be watched and heard, without being conscious about the program being broadcasted or program recorded in the past.

[0165]

Further, in the case where the user desires to perform viewing of software which is available on the market, he selects the menu of media (Media) on the main menu screen and goes down the layers sequentially (FIG. 18). A list menu of programs is then displayed with respect to a desired medium. By selecting an aimed (target) program from this menu, a desired program can be watched and heard like in the case of operating the other menus of recommended channels and categories.

[0166]

When thus going down the layers from the main menu screen, a focus area is formed at the screen center on the main menu screen, and a focus mark W is formed so as to surround this area. Further, in response to an operation of the selection operation key 18C arranged on the remote commander 18, the main menu screen is scrolled in the state where the focus mark W indicating the focus area is fixed. Thus, focus is switched.

[0167]

Thus, in case of selecting a desired menu on the main menu screen, a desired menu can be selected without moving diligently the view point every time to look for a focused menu. Thus, convenience of the can be improved

accordingly.

[0168]

Moreover, in case where any menu is selected on the main menu screen, each menu is gradually enlarged and is displayed (FIG. 8) on each of the subsequent menu screens of recommended channels (FIG. 7), categories (FIG. 13), and media (FIG. 19) such that the display zooms in onto each of the menus of the recommended channels, categories, and media (FIG. 8).

[0169]

Thus, in the set-top box 1, a result of operation selected by the user himself or herself is confirmed with eyes so that switching of the menu screen can be confirmed. Even in case of performing management of various programs by layering, error operations can be avoided effectively. Also, the user can grasp, with eyes, the relationship between the display screens before and after switching and can observe the switching of the display screens. Therefore, the user can avoid a situation of losing himself or herself, e.g., the user loses which layer or class the display screen currently displayed is as in the case where the screen is momentarily switched. Also by employ such an approach, the convenience of use can be improved.

[0170]

On each menu screen thus switched, a focus area is formed at the screen center like the case of the main menu screen, and a focus mark W is formed so as



to surround this area. Further, nine menus are disposed for each menu screen. Among the nine menus, the menu disposed in the focus area at the screen center and surrounded by the focus mark W is displayed in an enlarged manner.

[0171]

Thus, in case of selecting a desired menu, a focused menu can be quickly searched so that convenience of use can be improved accordingly.

[0172]

Moreover, these menus are displayed as icons on the other menus than the menu at the center. To the contrary, the menu focused at the center is displayed as an icon in the case where there are menu screens of lower layers (FIGS. 13 and 19), and the same menu is displayed as a child screen (FIG. 7) which shows the program in the case where there does not exist a menu screen of the lower layer.

[0173]

Thus, in the set-top box 1, whether or not corresponding program is a desired program can be judged by observing this child screen with eyes. Also, in this manner, the desired program can be quickly and accurately selected.

[0174]

Moreover, also menu screen, in response to an operation of the selection operation key 18C disposed at the remote commander 18, each screen is scrolled so that the focus is switched while fixing the focus mark W indicating the focus area. Further, in accordance with this scrolling, displays of menus which are out

of focus are switched to displays of small icons, and a newly focused icon is displayed in an enlarged manner. In the case where there does not exist a menu screen of lower layer, this icon is switched to a child screen (FIG. 9).

[0175]

Thus, in each of the menu screens of the layers below by one with respect to the main menu screen, a desired menu can be selected easily and steadily without moving the view point every time in the case of selecting a desired menu. Thus convenience of the can be improved accordingly. Moreover, a desired menu can be selected by operation unified with (or common to) the main menu. Thus, convenience of use can also be improved accordingly.

[0176]

Thus, in the case of the recommended channels of the lowermost layer in which menu screen subsequent to the main menu screen is of lower layer, it is possible to watch and hear a desired program, going down the layers sequentially by opening the menu thus selected (FIG. 10).

[0177]

In contrast, with respect to category or medium in which menu screens of lower layer exist, the display screen can be switched into a menu screen of the subsequent lower layer by selecting a menu on each menu screen to open the menu.

[0178]

Also in this case, in the set-top box 1, the display of the menu is gradually enlarged and the menu screen is thus switched so as to zoom in onto the focused menu, like in the case of switching the display to a menu screen of a layer lower than the main menu screen (FIG. 15).

[0179]

Thus, the user can confirm the result of operation, which the user herself or himself selects, with eyes and can confirm switching of the menu screen, like in the case where the display of the menu screen of layers lower than the main menu is switched. Therefore, even in the case where management of various programs is performed by layering, erroneous operation can be effectively avoided so that convenience of use can be improved. Moreover,, a desired menu can be selected by operations unified with (or common to) the main menu. Thus, convenience of use can be improved accordingly.

[0180]

If an icon is enlarged to be greater than a predetermined value when the menu screen is thus switched by zoom-in, this icon is rendered gradually transparent by transparency processing so a subsequent menu screen is displayed. In this manner, switching of the menu screen is smoothly perceived so that the menu screen can be switched without a feeling of disagreement.

[0181]

Further, in the case where a large number of, i.e., nine or more menus are

assigned to the menu on which the display should zoom in when the menu screen is thus switched, the entire screen where all the icons corresponding to respective menus are arranged is once displayed and the menu screen is switched so as to zoom in onto the entire screen (FIGS. 15 and 16).

[0182]

Thus, the user can operate a next menu screen, grasping the entire image of a huge number of programs, for example, even in the case where a huge number of programs are recorded with respect to the category of movie. Accordingly, for example, even in the case where a movie which is not displayed on the menu screen is selected on a menu of the lower layer side of the movie, a desired menu of movie can be selected without returning, every time, to the menu screen of the original layer. As a result, a desired program can be quickly and securely selected.

[0183]

Further, in the set-top box 1, each menu screen and further the entire screen are scrolled and the focus is switched with the focus area fixed at the screen center even in the case of the menu screen of a lower layer thus displayed. Accordingly, displays of menus out of the focus are switched to display of small icons. Thus a newly focused icon is displayed in an enlarged manner. If there is no menu screen of a lower layer, this icon is switched to a child screen (FIG. 9).

[0184]

Thus, in case where a desired menu is selected also on the menu screen of the lower layer, a desired menu can be selected easily and securely without moving the view point every time to seek a focused menu. Thus, convenience of use can be improved accordingly. Also, a desired menu can be selected by operation unified with (or common to) the main menu. Thus, convenience of use can be improved accordingly.

[0185]

Thus, in the set-top box 1, the menu screen thus selected with respect to categories and media is a menu screen of program selection of the lowermost layer. Therefore, an aimed (target) program can be easily and quickly watched and heard by selecting and opening a desired menu.

[0186]

In both of the cases where the display is shifted to a menu screen of a lower layer and the case where a program is selected with respect to the menu selected as described above, in the set-top box 1, the display screen can be switched to lower layers and a program can be selected by performing pressing operation of the selection operation key 18C disposed on the remote commander 18, as a determination operation key 18C.

[0187]

On the contrary to the above, user operates the cancellation operation key 18D, thereby making to return to menu screen of upper layer side. Also in this

manner, in the case of going up and down layered menu screens, programs can be selected by unified (common) operations. Thus, erroneous operation can be prevented accordingly so that convenience of use can be improved.

[0188]

Further, in the case of returning to a menu screen of an upper layer by operation of the cancellation operation key 18D, the display screen is switched so as to zoom out and the entire screen is displayed if necessary, on the contrary to the case of going down to the lower layer side.

[0189]

In this manner, even in case of returning to upper layer, the user can return to upper layers, grasping the entire image, without confusion, so that a desired program can be selected rapidly and accurately.

[0190]

When the shift operation key 18E is caused to undergo pressing operation and the determination operation key 18C is operated on the menu screen of program selection of the lowermost layer with respect to recommended channels and categories (FIGS. 6 and 12) in switching menu screens sequentially, in this way the display is switched to a screen of program guide. Moreover, when the cancellation operation key 18D is operated with the screen of the program guide displayed, the display returns to the original menu screen.

[0191]

In the case of a recommended channel, broadcasting schedules with respect to focused respective virtual channels are displayed sequentially in the order of broadcasting times, in different colors distinguished between categories, on the screen of the program guide. In this manner, the programs on the broadcasting schedule can be confirmed, and processing for setting timer recording or the like can be executed if necessary. In contrast, in the case of categories, a broadcasting schedule and programs which can be watched and heard by various media are displayed as a list, with respect to a focused category, so that a desired program can be watched and heard based on the basis of the title or the like.

[0192]

In this manner, in the case where a program is selected by operation different from ordinary operation for program selection in which a program is selected following layers, a desired program can be selected by operation similar to the case of following layers and using additionally the shift operation key 18E. As a result, the operation is unified Accordingly. Thus, convenience of use is improved.

[0193]

In contrast, on the program selection menu of media, the display is switched to the second search screen (FIG. 25) when the shift operation key 18E and the determination operation key 18C are operated (FIG. 18).

[0194]

On the second search screen, with respect to a focused program, index images respectively set for scenes during recording are sequentially enlarged from the inner circumferential side, and the enlarged images are arranged and displayed spirally from the inner circumferential side. In this manner, the user can visually grasp the before-after relationship between the index images by perspective of the images sequentially enlarged, and the total elapse of time can be visually grasped from the spirally consecutive displays. Thus, the flow of the program and each scene can be easily understood, so that a head of a predetermined scene can be found easily and quickly. Accordingly, the convenience of use can be improved. Also, if the enlarged image are displayed spirally from the inner circumferential side in the time-series order, an image in the future is not overlapped on a image close to the present time.

[0195]

Moreover, on the second search screen, index images closer to the present time which should be studied in more details are displayed in relatively larger sizes. On the contrary to the above, index images far from the present time which should be less studies are displayed in smaller sizes as compared to that at current time point. In this manner, images which the user desires to watch and hear are displayed specifically so that the display screen can be effectively utilized.

[0196]

Moreover at this time, the display becomes gradually faded out as the index



images are positioned closer to the center of the spiral, so that the background can be seen through. In this manner, the display obtains depth, so that elapse of time can be easily grasped.

[0197]

Moreover, at this time, those index images are arranged on the background spreading radially from the center of the spiral layout, so that perspective is added also by the background. Elapse of time can be easily grasped by the perspective.

[0198]

Thus, in the case of searching a head of a desired scene by each index images in this way, the index images are moved in the circumferential direction with the focus area fixed, in response to operation of the selection operation key 18C in the leftward and rightward directions, and the sizes of the index images are changed into sizes corresponding to the positions after the movement (FIG. 26). In this manner, the index images can be switched so as to visually follow the time axis, and the convenience of use can be improved accordingly. Also, at this time, since the focus area is fixed, the movement of the view point is prevented so that the focused index image can be found easily.

[0199]

Moreover, in response to operation of the selection operation key 18C in the upward and downward directions, the index images are moved in the inter and outer circumferential with the focus area fixed, and the sizes of the index images

are changed into sizes corresponding to the positions after the movement (FIG. 27). In this manner, the index images can be switched so as to jump greatly along the time axis, with one turn of the spiral layout taken as a unit, so the jump in the time-axis direction can be grasped visually. Accordingly, the convenience of use can be improved. Also, at this time, since the focus area is fixed, the view point is prevented from being moved so that a focused index image can be easily found.

[0200]

When the index images are moved in this way to switch the focus, the index images are set such that the index images closer to the inner circumferential side are displayed to be gradually faded, and the index image positioned at the front side in the time axis direction is also displayed to be faded. Therefore, for example, in the case of switching the focus in the direction along the time-axis, the index images are displayed as if the index images floated up and came close from the center of the spiral. On the contrary to the above, in the case of switching the focus in the direction opposite to the time-axis direction, the display is switched such that an index image which has not observed before comes into the view field.

[0201]

In this manner, on the second search screen, the display is switched as if the view point was moved within the index images arranged three-dimensionally with the time-axis taken as a standard. Accordingly, the convenience of use can be improved much more.

[0202]

After an index image is thus selected, a desired program can be reproduced from the scene with the focused index image as the top of the scene, by operating the determination operation key 18C, like the case of going to a menu of a lower layer (FIG. 18). On the contrary to the above, it is possible to return to the original program selection menu by operating the cancellation operation key 18D, like the case where convenience of use can be improved. Thus, it is possible to find a desired scene by unified operation between corresponding menu screen and other menu screen.

[0203]

On the contrary, on the screen of program display by media, when operation key 18E of shift is pushed down, the first menu screen is displayed by the time period during which the operation key 18E of shift is caused to undergo push-down operation (FIG. 18).

[0204]

Here, on the first menu screen (FIG. 23), in the case where the medium can be random-accessed, screens which have been displayed up to the time are displayed in a contracted manner so that index images are arranged in line in order at the lower side of the screen. Further, area of focus is set at the central index image. The index image thus focused is displayed in the state enlarged as compared to other index images.

[0205]

Also on the first menu screen, as the result of the fact that arrangement of index images is scrolled in the state where the area of focus remains to be fixed in response to operation of the operation key 18C of selection, switching between index images of focus is performed. Thus, it becomes possible to easily find out index image which has been focused by user. Moreover, when the operation key 18C of determination is pushed down after index image is selected in this way, image displayed to be large can be switched into scene by the index image. When push-down state of the operation key 18E of shift is released after a desired scene is selected in this way, display state returns to the original program display by the scene of which head has been found, thus to have ability to perform viewing (watching/hearing) of program.

[0206]

Thus, scene can be jumped as occasion demands during viewing of program to continue viewing of program. As a result, operability (convenience of use) can be improved accordingly.

[0207]

At this time, in the set-top box 1, the first search screen is displayed for only time period during which the shift operation key 18E is operated. Accordingly, increase of the number of operation keys on the remote commander 18 (FIG. 3) is prevented, so that it is possible to provide a menu for information

selection like the first search screen, which is different from the other screens. Accordingly, in the case of providing a larger quantity of information, operability (convenience of use) of an information providing apparatus of this kind can be improved.

[0208]

Moreover, the shift operation key 18E which is thus operated is structured such that this key can be operated by a forefinger, gripping the remote commander 18. In contrast, the determination operation/selection operation key 18C is structured such that the key can be operated by a thumb finger, gripping the remote commander 18 likewise. Therefore, the remote commander 18 can be operated by one hand so that a head of a desired scene can be found easily.

[0209]

Further, at this time, since the shift operation key 18E is arranged separately from the other operation keys 18A, 18B, 18C, and 18D, user can operate a search screen as a display screen of information selection which is different from the other screens can be operated, distinguished from a menu screen as another information selection screen. Accordingly, erroneous operations can be prevented in comparison with the case where the operation key for selecting this search screen is arranged without distinguishing this key from the other operation keys, so that operability (convenience of use) can be improved accordingly.

[0210]

With respect to the operation key 18C which receives an operation with the shift operation key 18E operated, a selection/determination function is assigned like the menu screen as other information selection screen. Accordingly, a head of a desired scene can be found by operation unified with (or common to) other menu screens.

[0211]

In contrast, in the case where the operation for selecting the first menu screen is carried out with respect to a medium such as a video tape which is difficult to randomly access, an icon which similar to an operation key of a video tape recorder is displayed in place of an index image, and a head of a scene can be found by operating this icon. Also, it is possible to return to the original screen by releasing the pressing state of the shift operation key 18E.

[0212]

Also, in this case, a head of a desired scene can be found by operation of selection/determination, and operation unified with that on the first menu screen or the like. Accordingly, operability (convenience of use) can be improved.

[0213]

### (3) Advantages/Effects of Embodiments

In accordance with the configuration as described above, an external equipment connected to the network at a predetermined timing is authenticated to unitarily perform management of program serving as information screen by using

the acquired program information. From this fact, even in the case where programs are acquired from plural information sources, it is possible to select information with the content of information being subject without becoming conscious information source. Thus, it is possible to easily, quickly and precisely provide desired information screen. As a result, operability (convenience of use) can be improved accordingly.

[0214]

(4) Other Embodiments

While the case where various program information are acquired through the home-net based on the IEEE 1394 bus has been described in the above-described embodiment, the present invention can be widely applied to the case where video equipments of this kind are connected by various networks without being limited to the above implementation.

[0215]

Further, while the case where the present invention is applied to the set-top box to provide information which are various programs has been described in the above-described embodiment, the present invention is not limited to such implementation, but can be widely applied to, e.g., editing apparatus and/or information screens by still image or methods of providing such information.

[0216]

[Effects/Advantages of the invention]

As described above, in accordance with the present invention, information for index is acquired through the network to categorize information screens by the index information thus acquired to form menu screen. Accordingly, even in the case where information screens of a large number of programs, etc. are provided from plural information sources, it is possible to easily and quickly select a desired program.

[Brief Description of the Drawings]

FIG. 1 is a block diagram showing a set-top box according to an embodiment of the present invention.

FIG. 2 is a block diagram showing an internal control section of the set-top box shown in FIG. 1.

FIG. 3 is a perspective view showing a remote commander of the set-top box shown in FIG. 1.

FIG. 4 is a block diagram showing the remote commander shown in FIG. 3.

FIG. 5 is a plane view showing a main menu screen.

FIG. 6 is a schematic diagram showing the relationship between the main menu screen and menus of the lower layer with respect to recommended channels.

FIG. 7 is a plane view showing a menu screen of the recommended channels shown in FIG. 6.

FIG. 8 is a plane view for explaining transit from the main menu screen to



the menu screen of recommended channels.

FIG. 9 is a plane view showing switching operation of the focus on the menu screen of recommended channels.

FIG. 10 is a plane view showing transit from the menu screen of recommended channels to display of a program.

FIG. 11 is a plane view showing a program guide in recommended channel.

FIG. 12 is a schematic diagram showing the relationship between the main menu screen and menus of the lower layer with respect to categories.

FIG. 13 is a plane view showing a menu screen of category shown in FIG. 12.

FIG. 14 is a plane view showing a menu screen of program selection of the category.

FIG. 15 is a plane view showing transit from the main screen of the category to the menu screen of program selection.

FIG. 16 is a plane view showing processing subsequent to FIG. 15.

FIG. 17 is a plane view showing a program guide in the category.

FIG. 18 is a schematic diagram showing the relationship between the main menu screen and menus of lower layers with respect to media.

FIG. 19 is a plane view showing the menu screen of media shown in FIG. 18.

FIG. 20 is a plane view showing a menu screen of program selection of

media.

FIG. 21 is a flowchart showing a processing procedure of an internal control section when switching a menu screen.

FIG. 22 is a flowchart showing processing subsequent to FIG. 21.

FIG. 23 is a plane view showing a first search screen.

FIG. 24 is a plane view showing the first search screen in case where media are difficult to randomly access.

FIG. 25 is a plane view showing a second search screen.

FIG. 26 is a plane views showing switching operation of the focus in the circumferential direction on the second search screen.

FIG. 27 is a plane view used showing switching operation of the focus in inne and outer circumferential radial directions on the second search screen.

FIG. 28 is a flowchart showing a processing procedure of the internal control section in the display of the first search screen.

FIG. 29 is a flowchart showing a processing procedure of internal control section in the display of the first search screen.

FIG. 30 is a flowchart showing processing subsequent to FIG. 29.

FIG. 31 is a flowchart showing a processing procedure of the internal control section on the display of the second search screen.

FIG. 32 is a flowchart showing processing subsequent to FIG. 31.

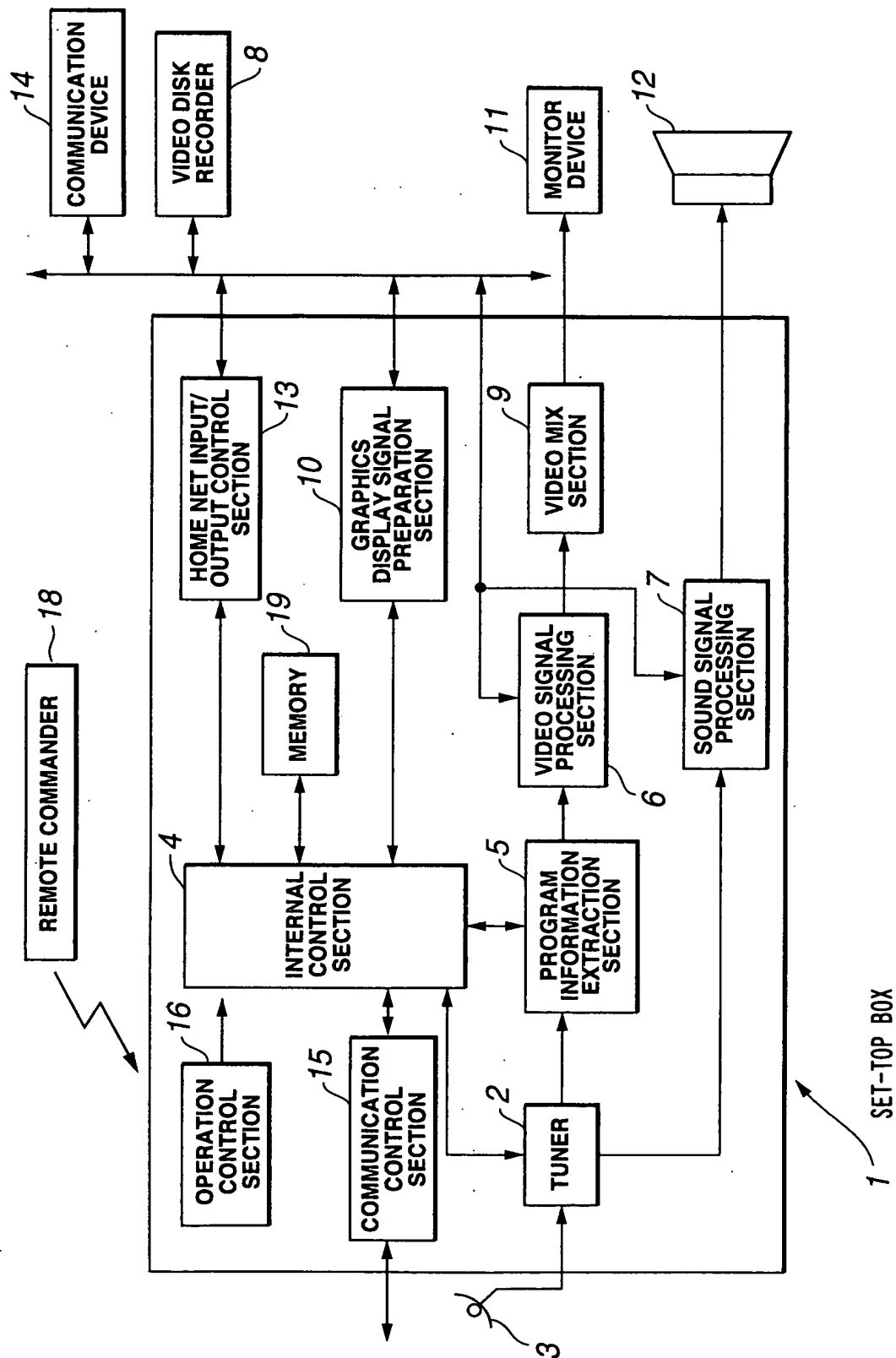
FIG. 33 is a flowchart showing processing subsequent to FIG. 32.

FIG. 34 is a flowchart used for explanation of operation of acquisition of program information.

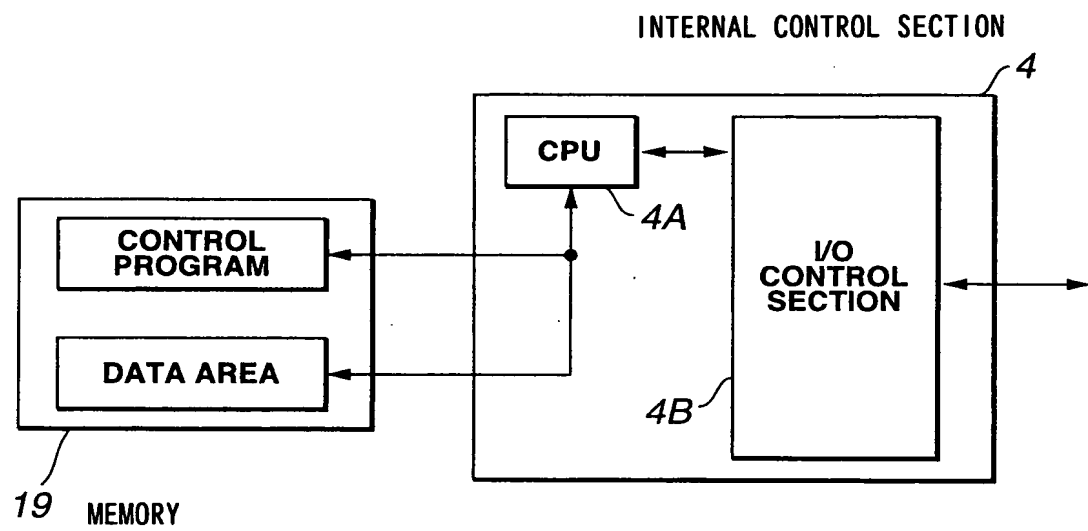
[Explanation of referenced numbers]

- 1      SET-TOP BOX
- 4      INTERNAL CONTROL SECTION
- 8      VIDEO DISK RECORDER
- 18     REMOTE COMMANDER

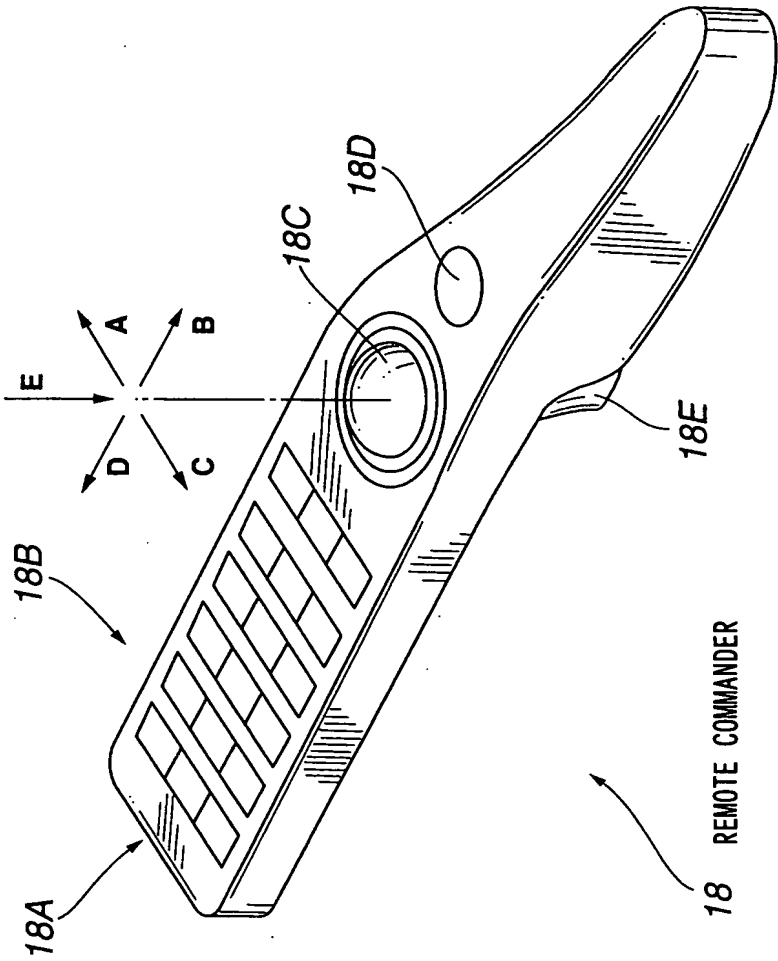
[DOCUMENT NAME] DRAWING  
[FIG.1]



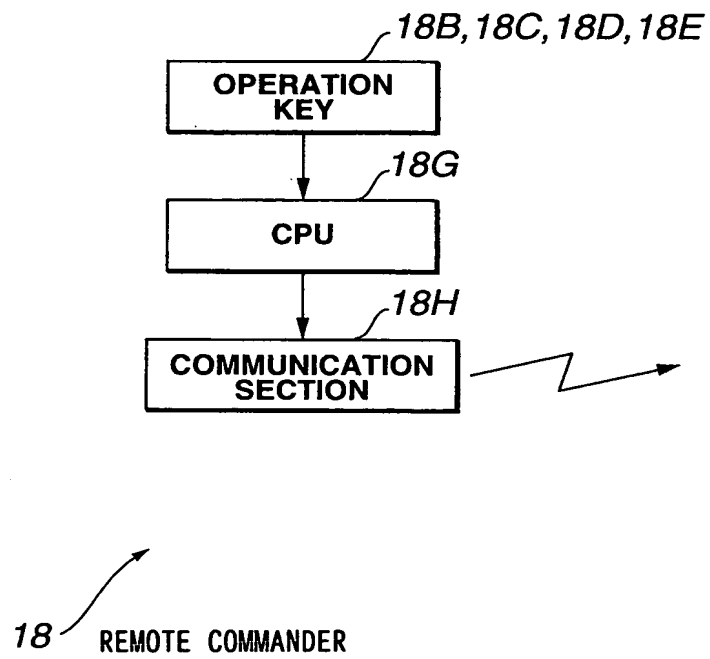
[FIG.2]



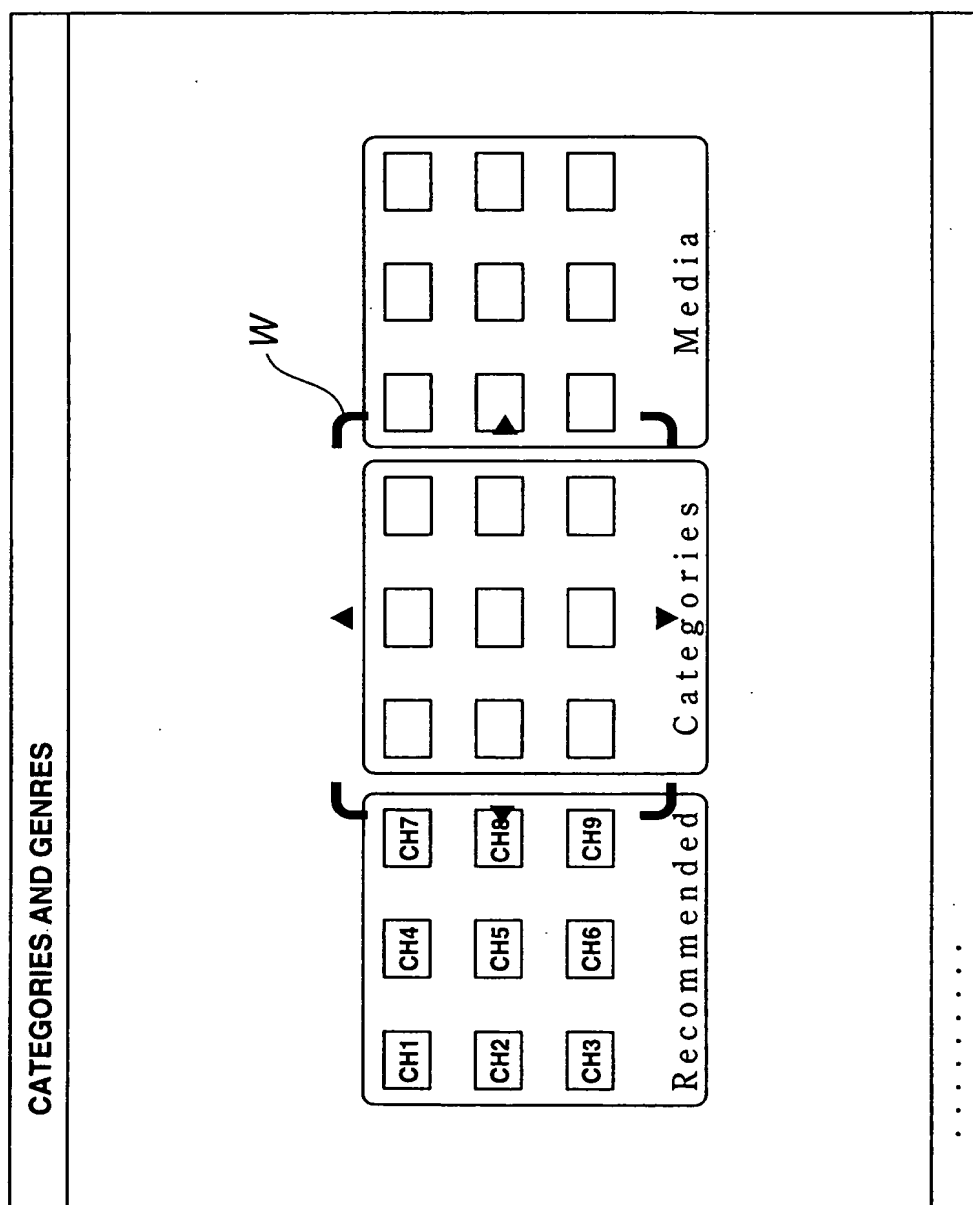
[FIG.3]



[FIG.4]

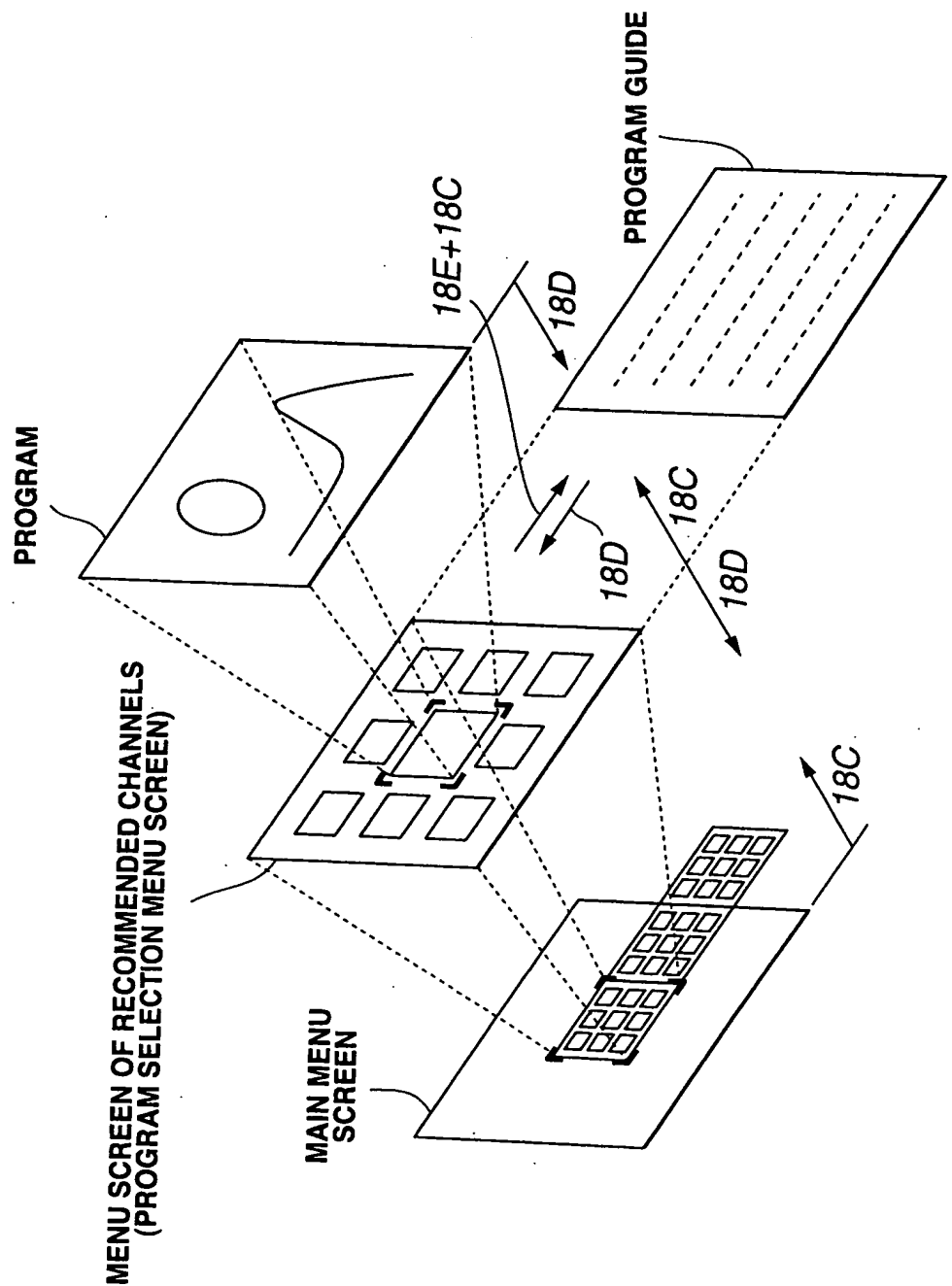


[FIG.5]

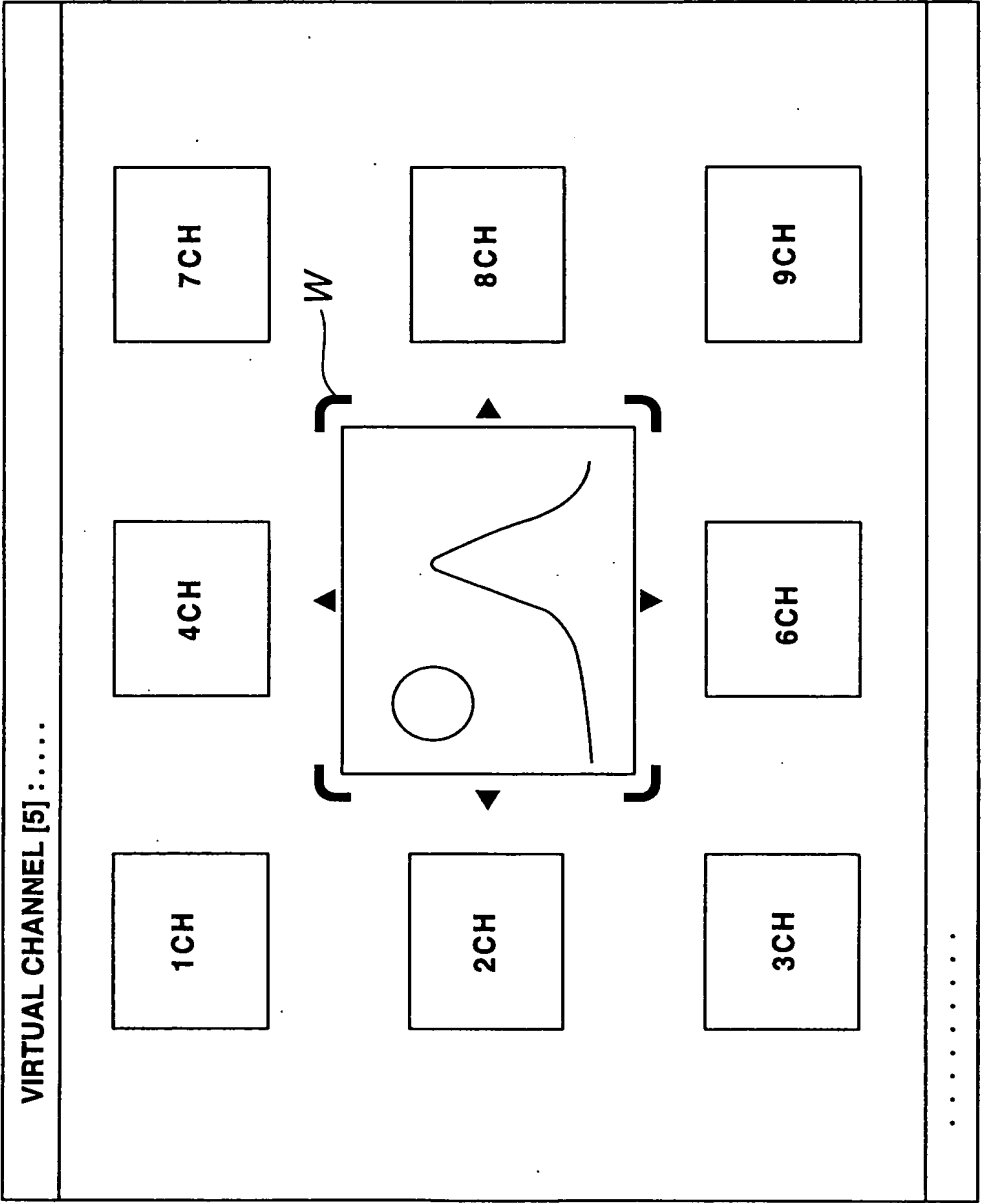




[FIG.6]

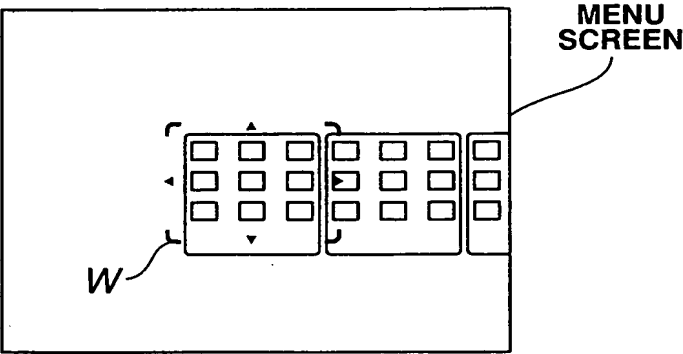


[FIG.7]

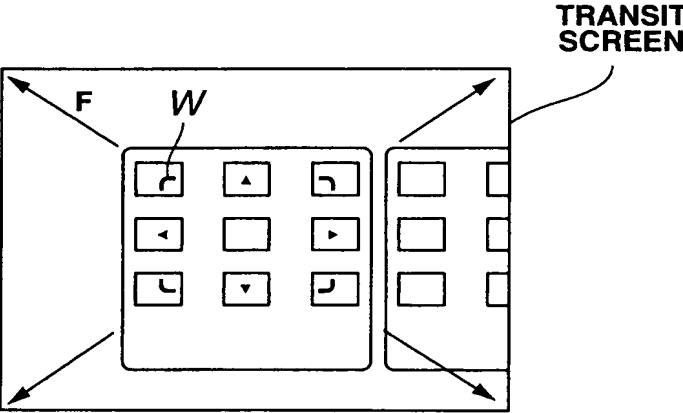


[FIG.8]

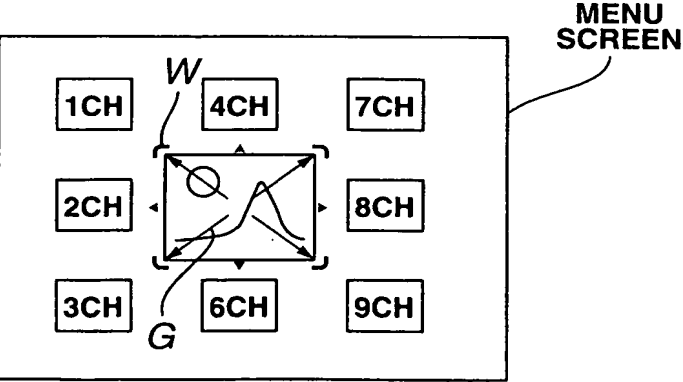
(A)



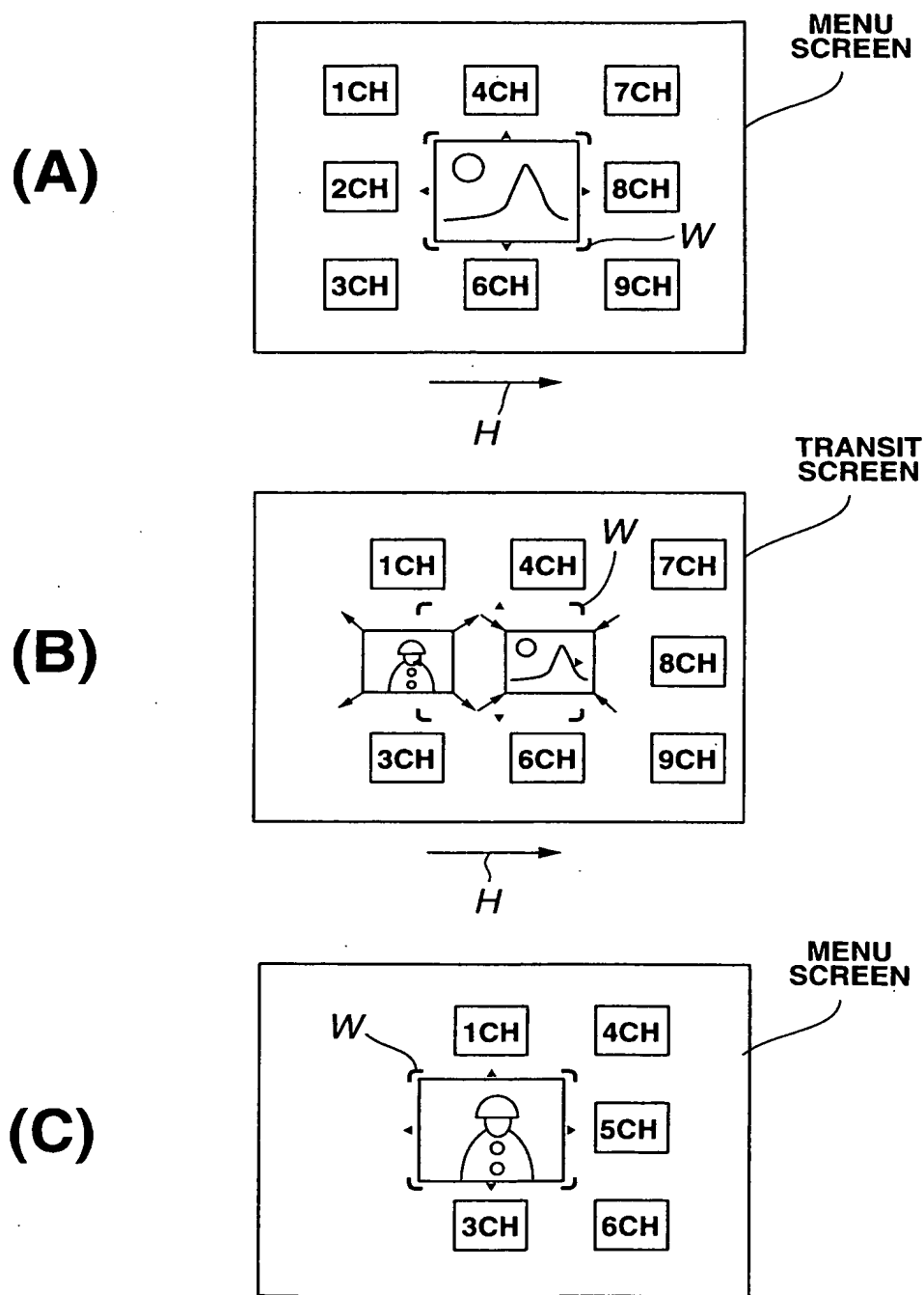
(B)



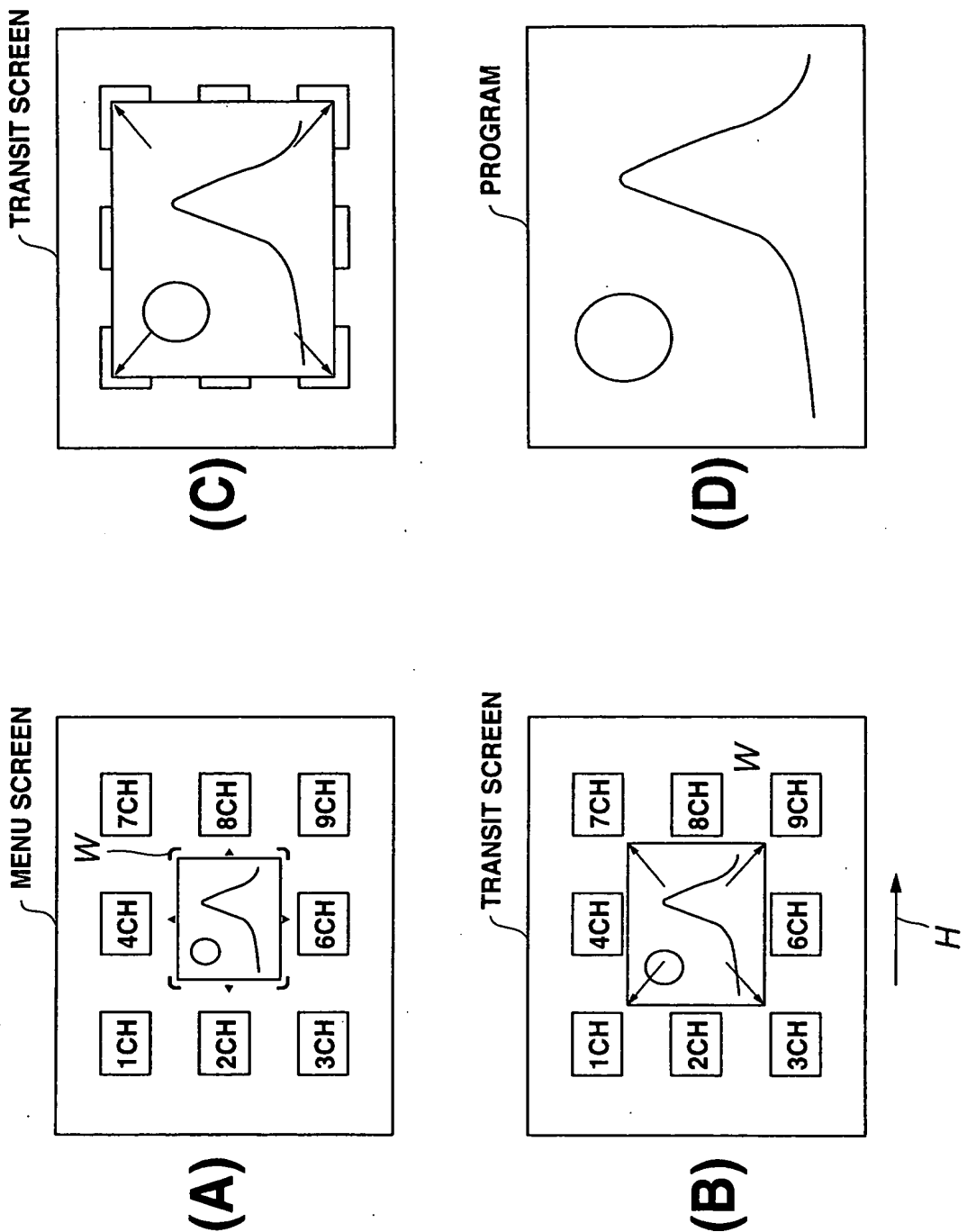
(C)



[FIG.9]



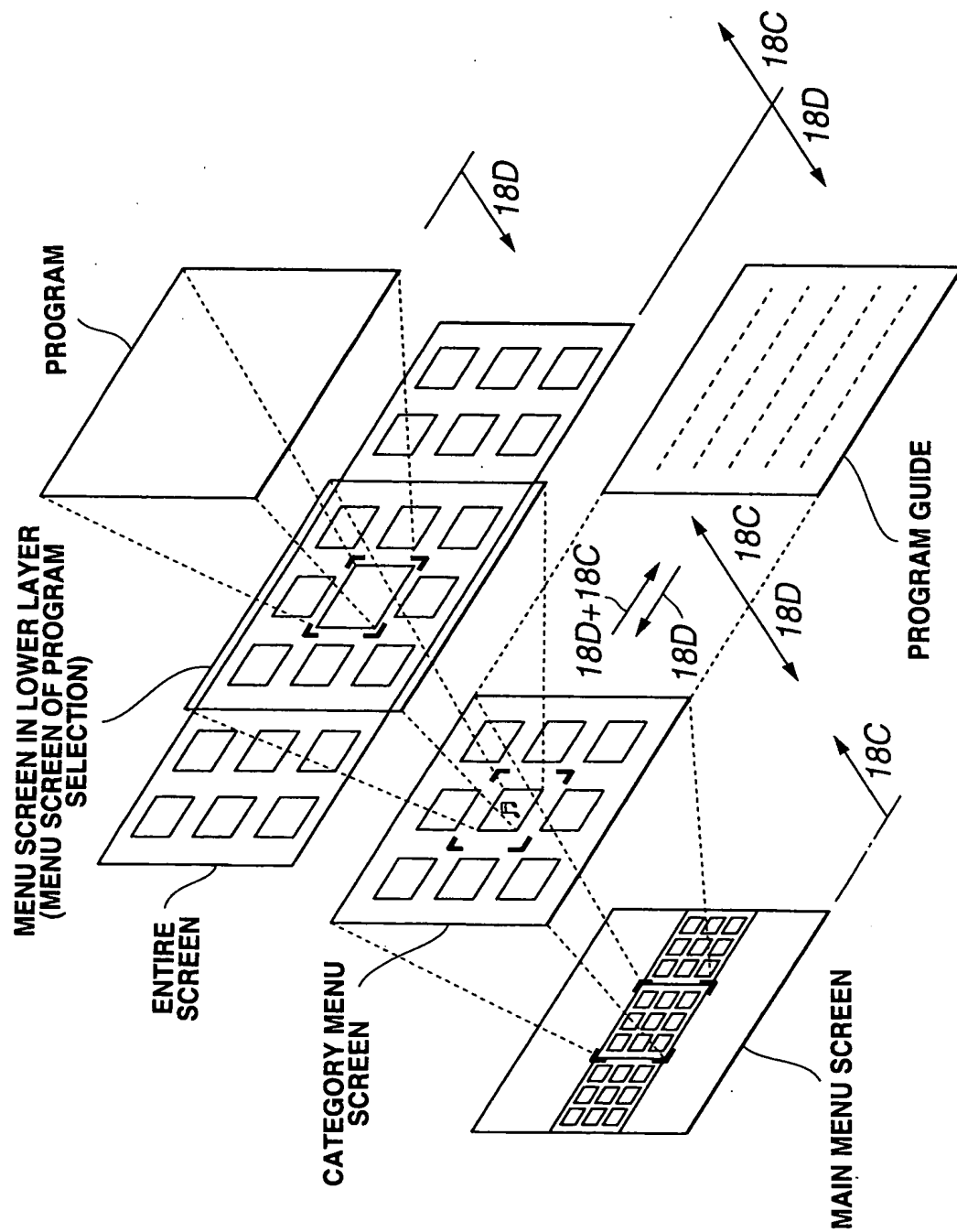
[FIG.10]



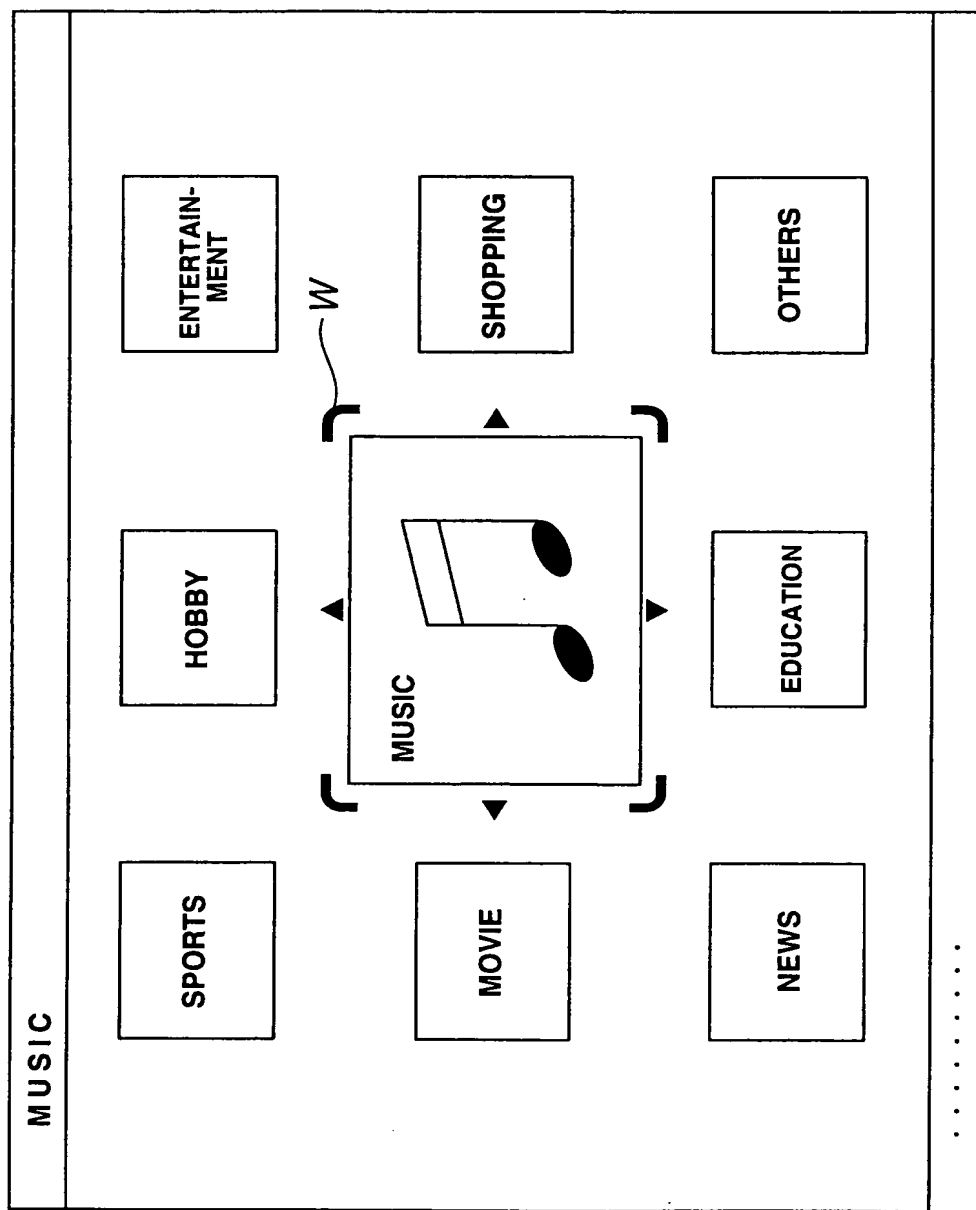
[FIG.11]

VIRTUAL CHANNEL [3] : ....	
[10/7 16:30] INFORMATION	
[10/7 20:00] FLOWER ON KUSATSU-SHIRANESAN(GUMMA PREFECTURE)	
[10/8 23:00] ECHOES OF SEA/KAZE NO IRUKA	
[10/8 25:58] BET JAB CENTRAL	
[10/8 1:00] ROCK'N' COUNTRY	
[10/8 23:20] DAVID HOCKNEY : ARTIST	
.....	

[FIG.12]

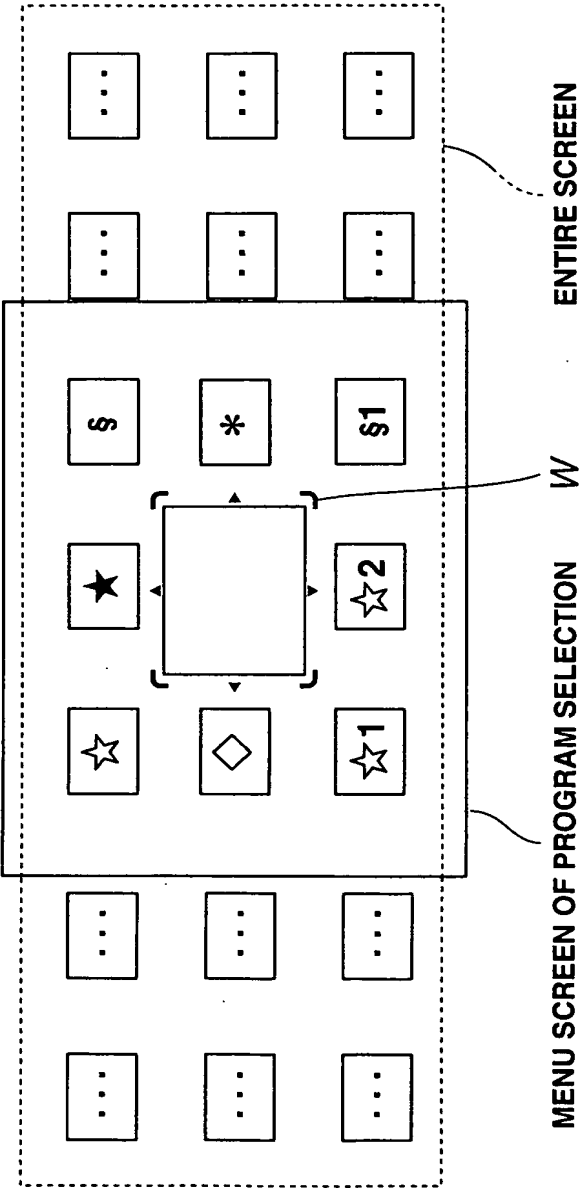


[FIG.13]

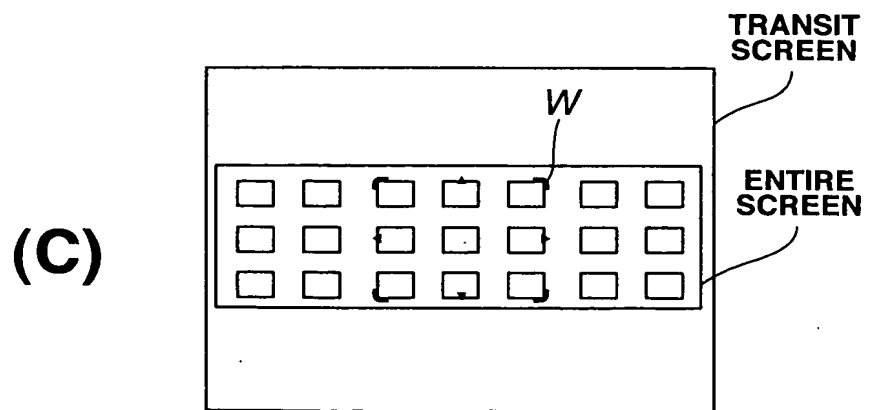
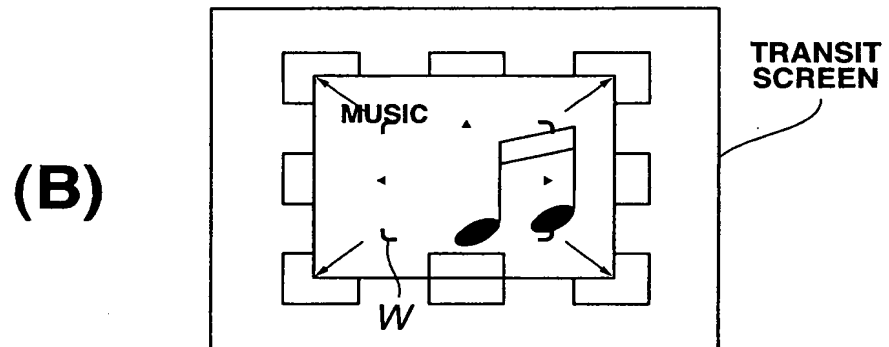
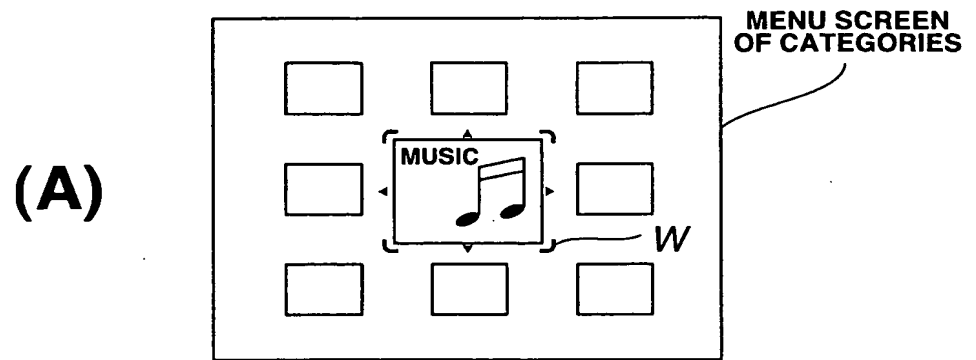




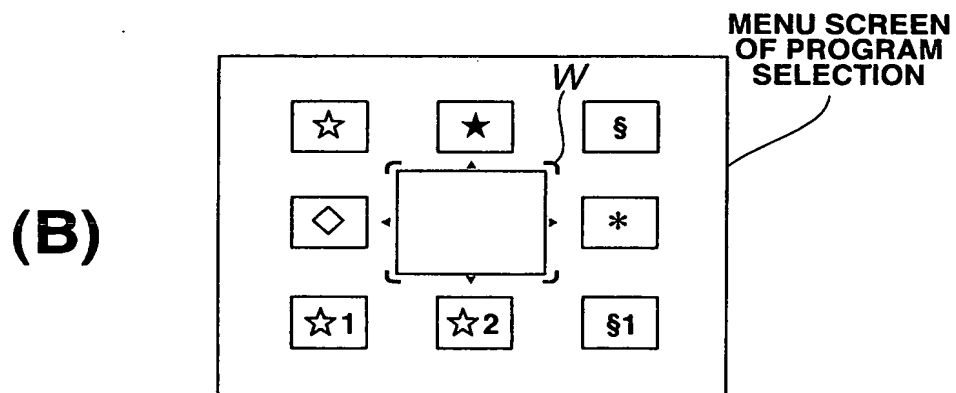
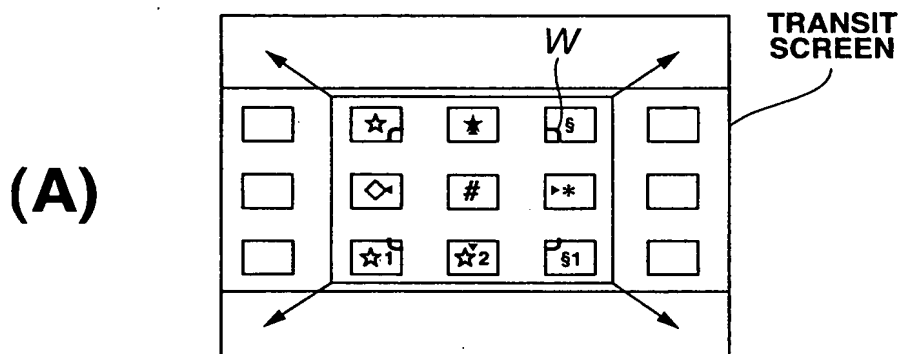
[FIG.14]



[FIG.15]



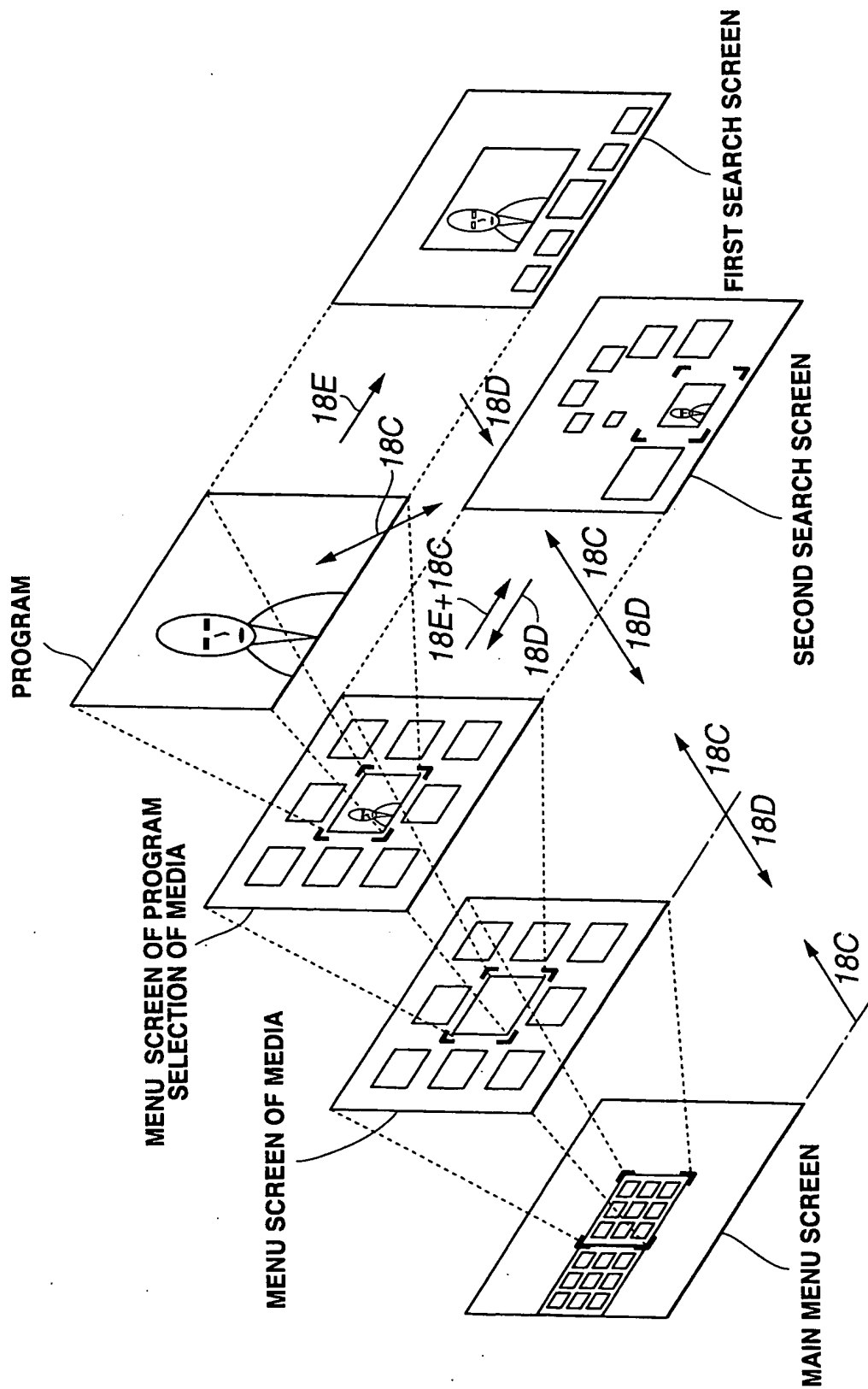
[FIG.16]



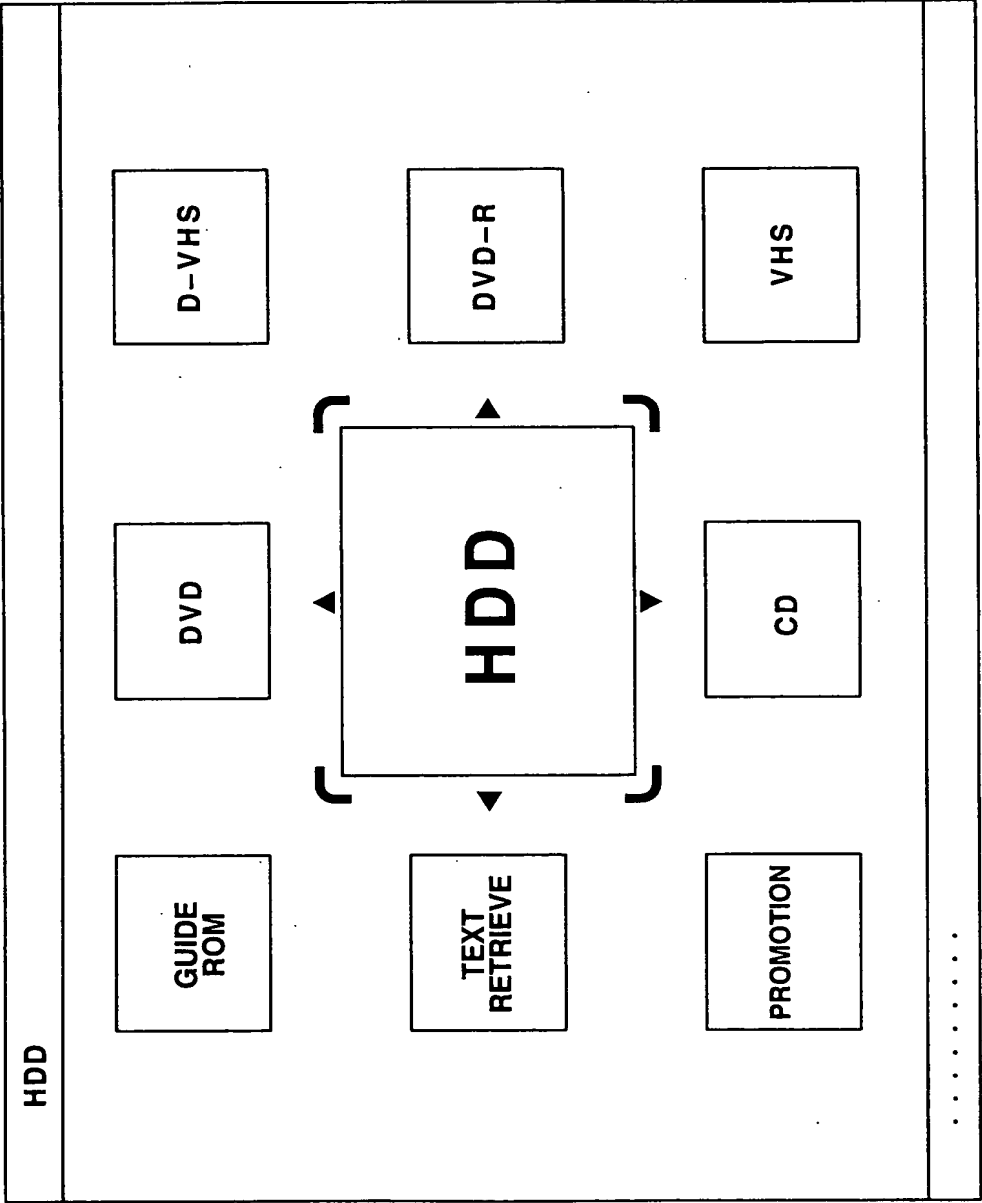
[FIG.17]

MOVIE
[10/7 8:00] CRIMINAL MISSION No.1
[10/7 8:10] Dr. JEKYLL AND MR. HYDE
[10/7 9:10] MYSTERY THEATER 2000
[10/7 10:00] QUEEN★
[10/7 10:00] GUN MEN/BALLADE FOR WOLVES
[10/7 10:35] MYSTERY THEATER 2000
[10/7 12:00] DEEP SLEEP FOR THEM
[10/7 12:40] Dr. JEKYLL AND MR. HYDE
[10/7 14:00] DOLL OF KID
[10/7 14:20] DEEP SLEEP FOR THEM
.....

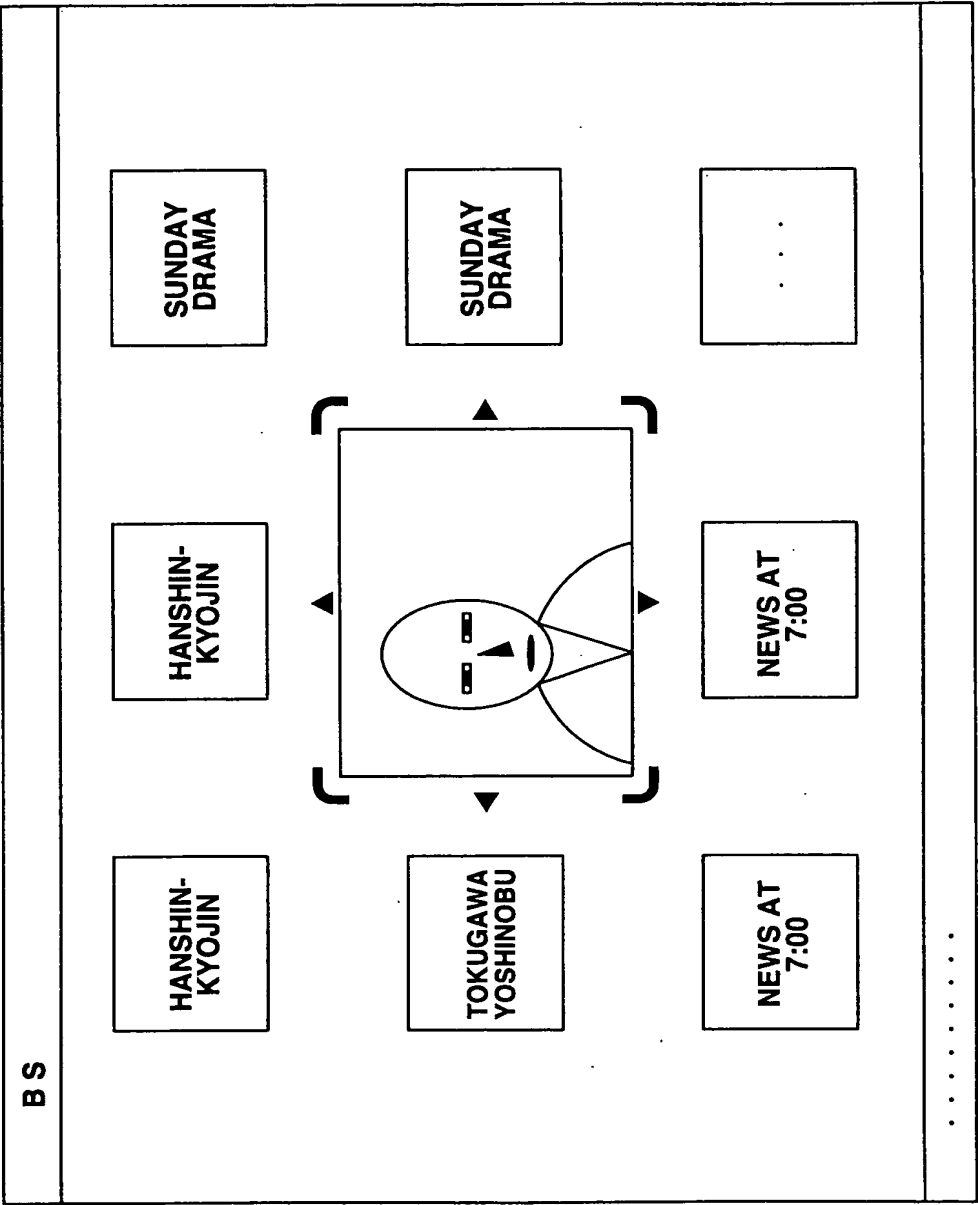
[FIG.18]



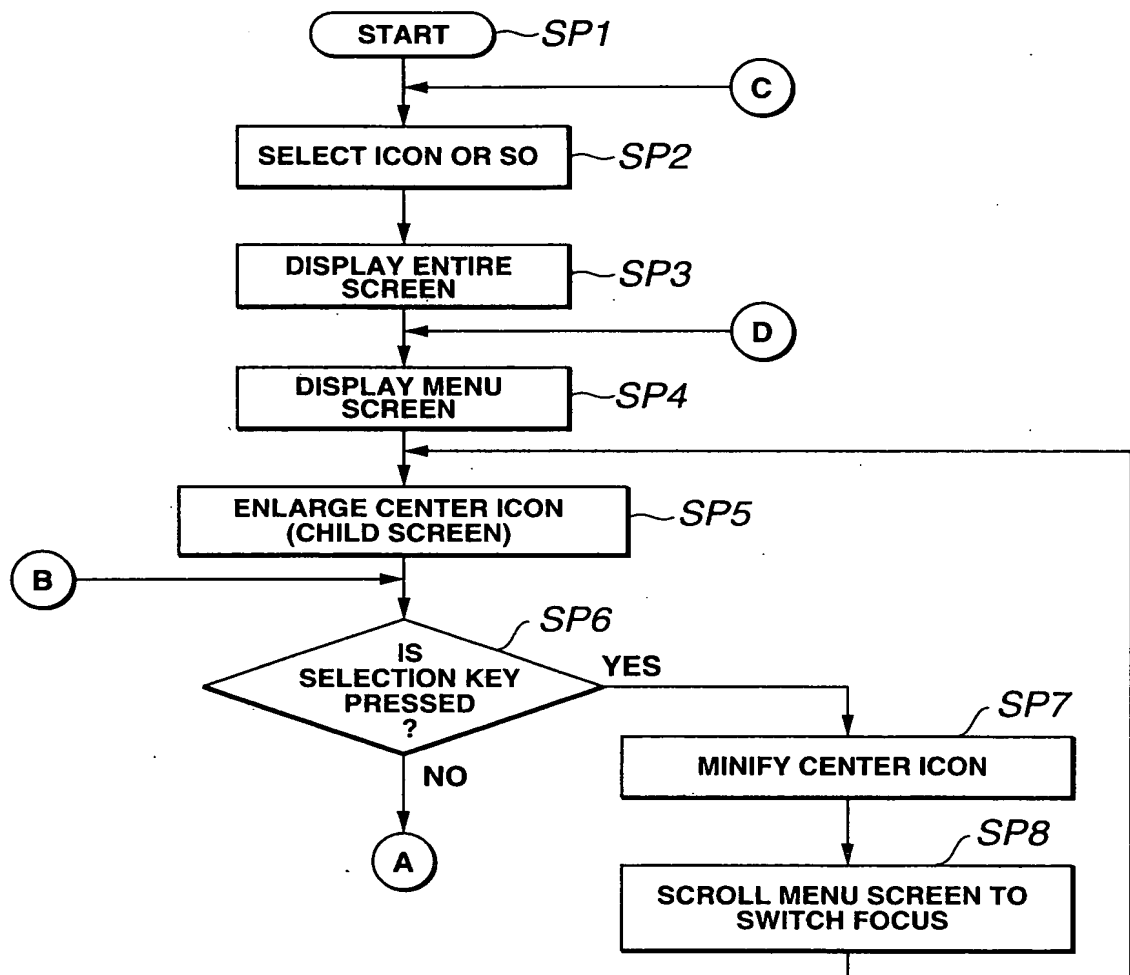
[FIG.19]



[FIG.20]

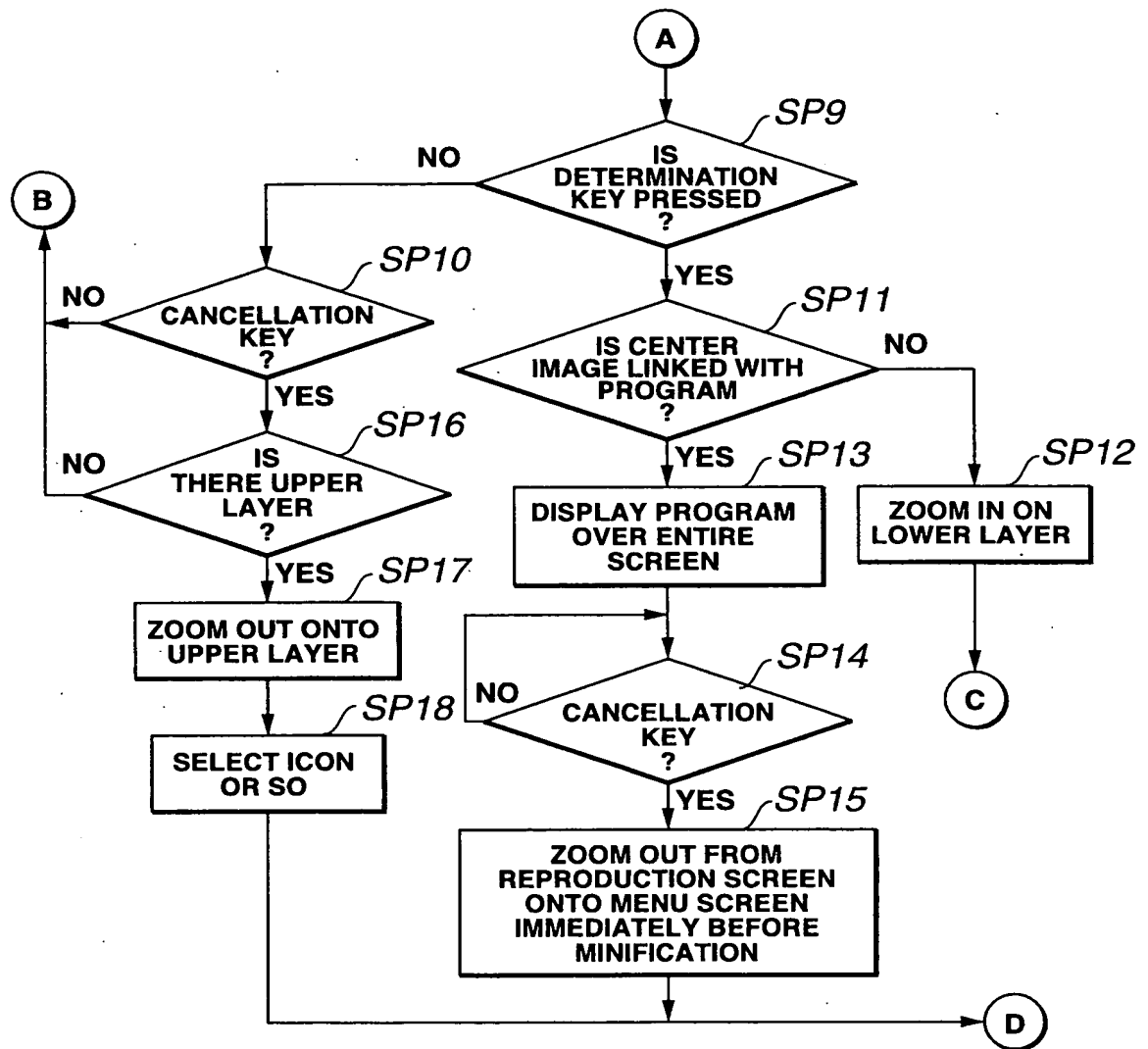


[FIG.21]

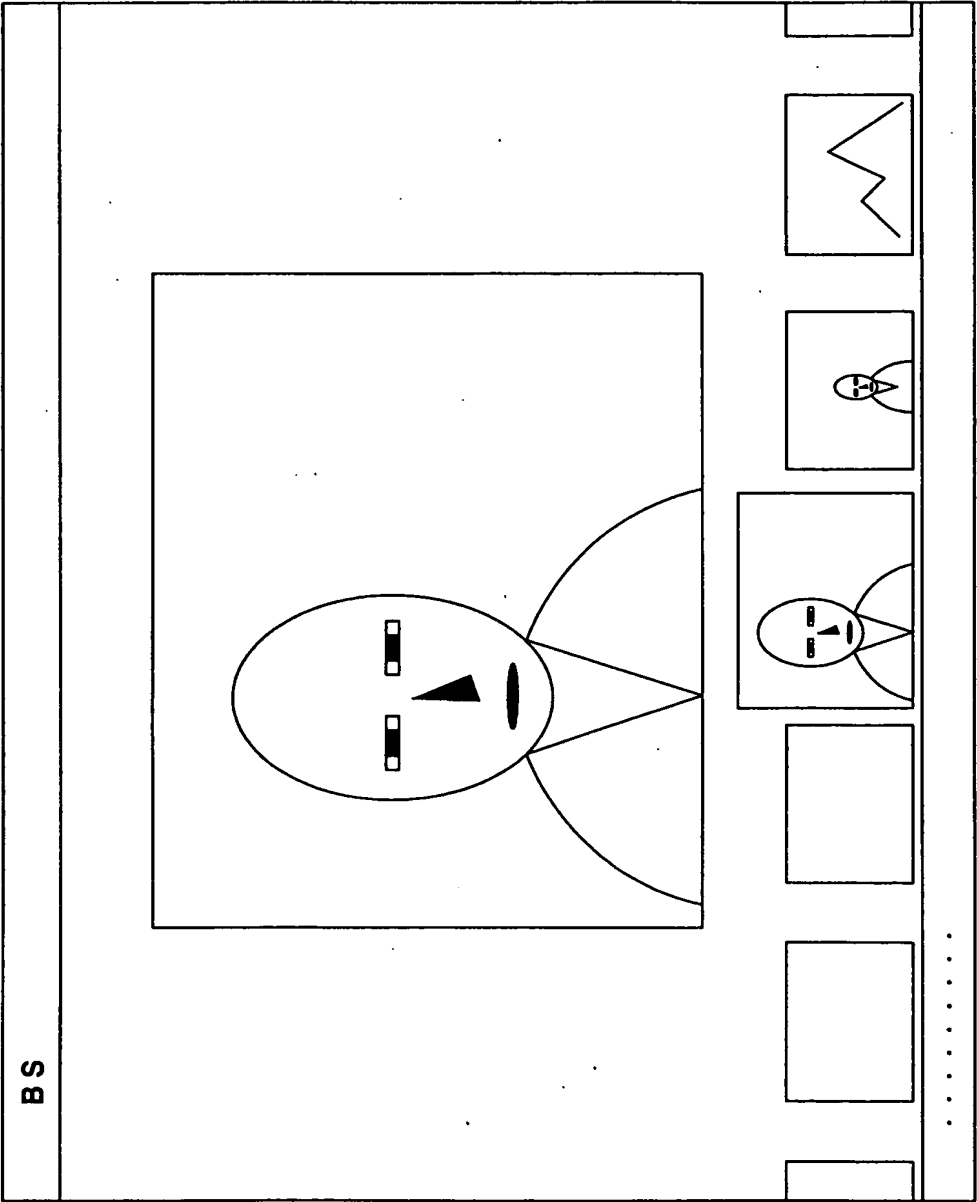




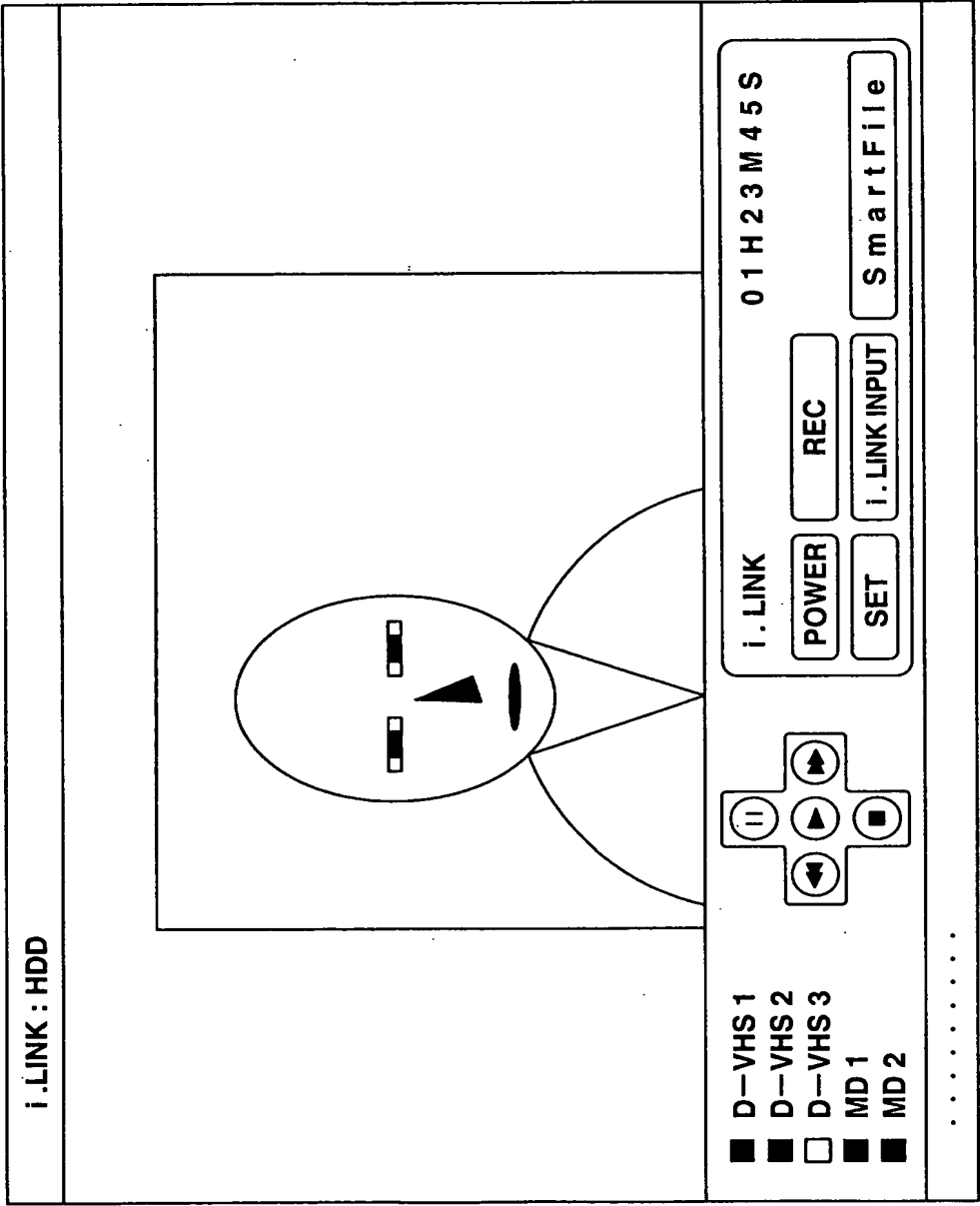
[FIG.22]



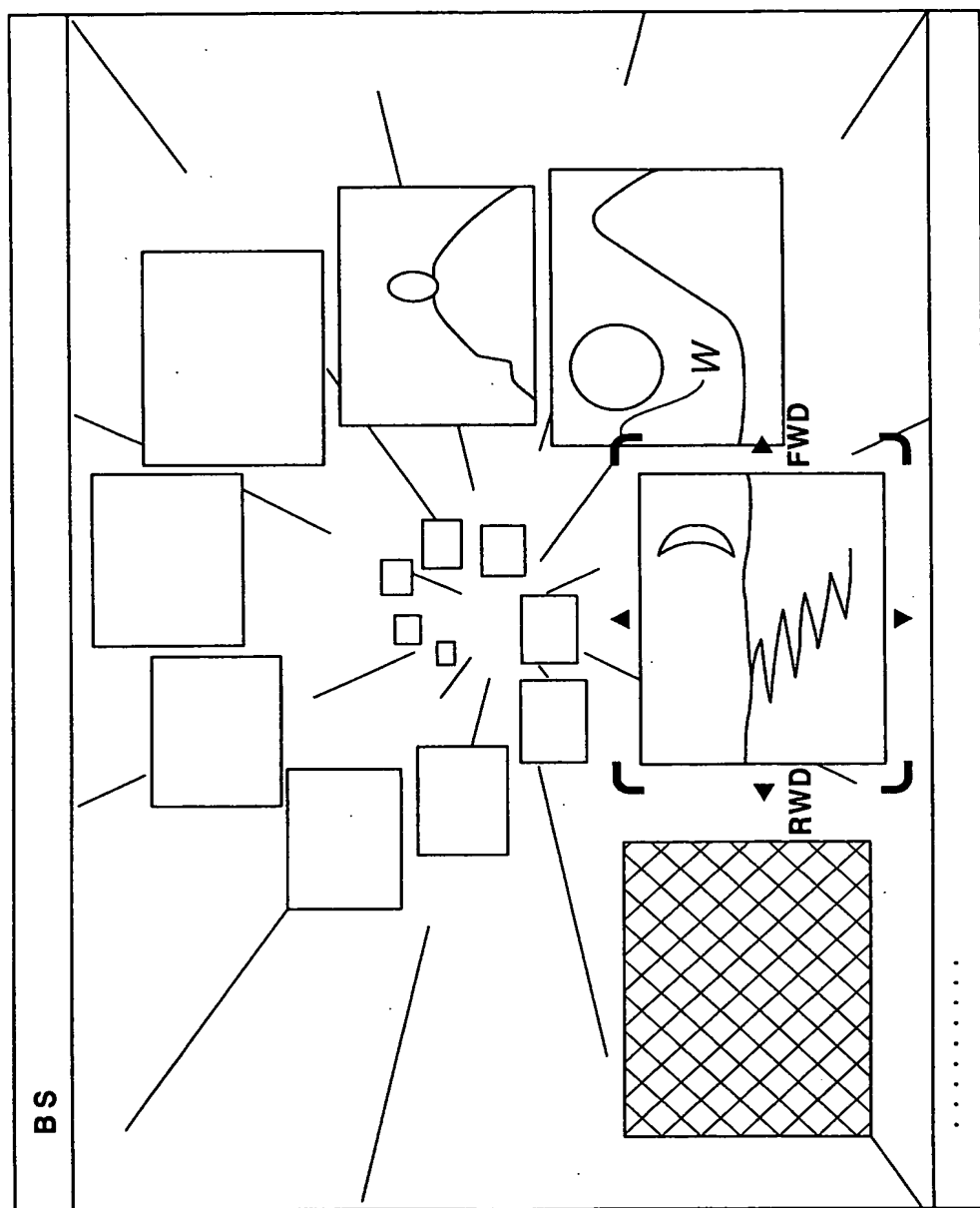
[FIG.23]



[FIG.24]

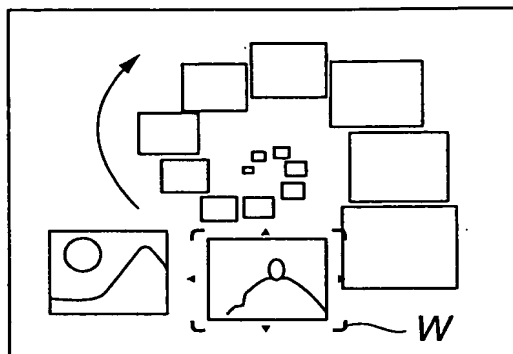


[FIG.25]

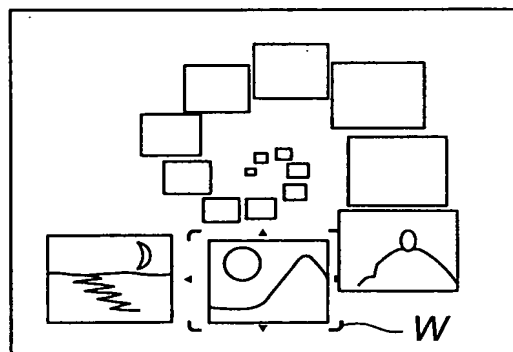


[FIG.26]

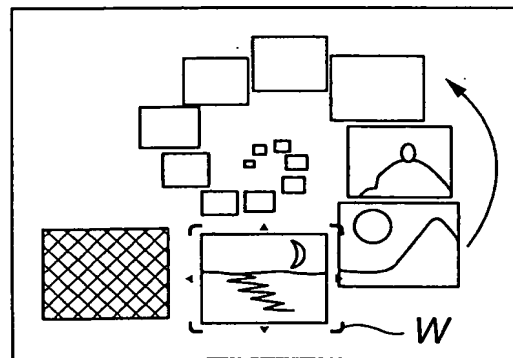
(A)



(B)

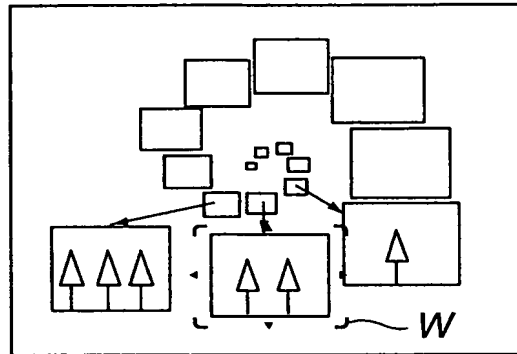


(C)

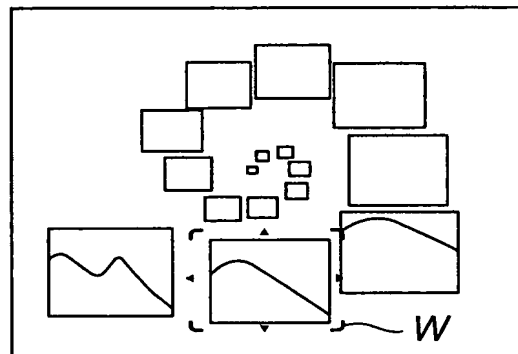


[FIG.27]

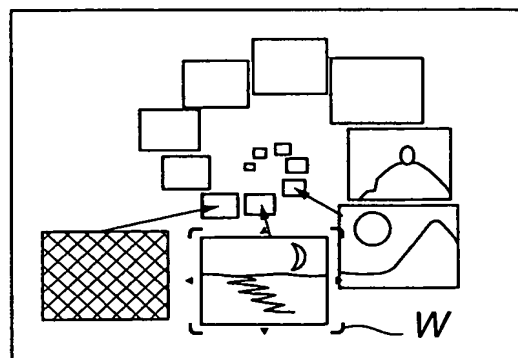
(A)



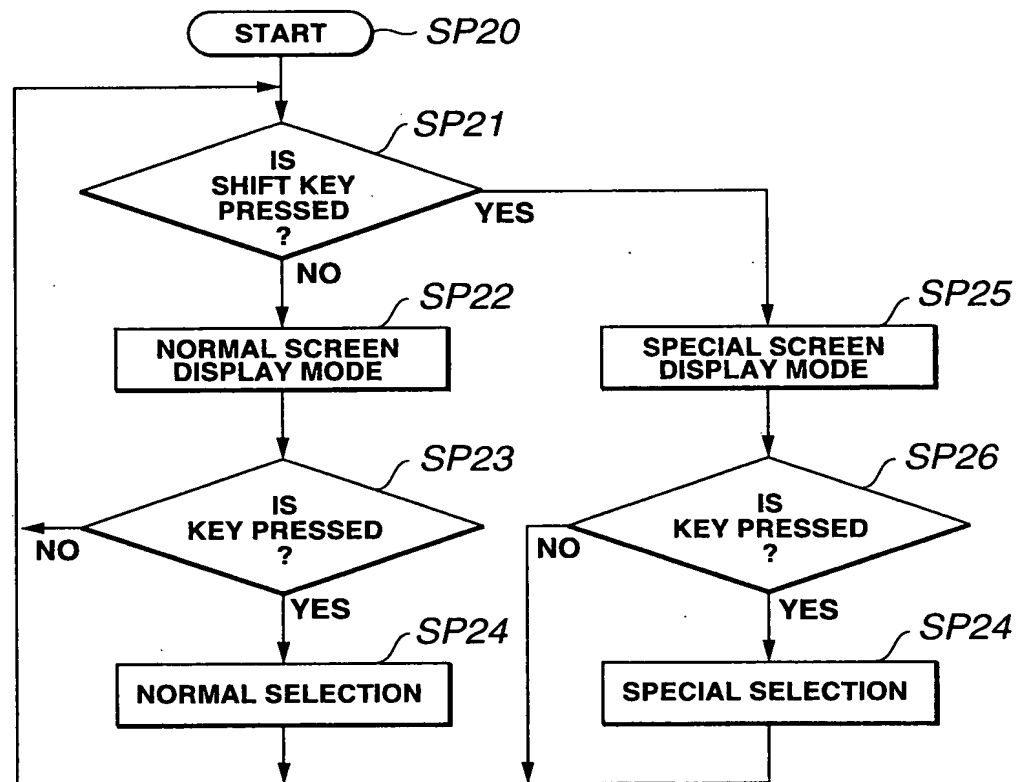
(B)



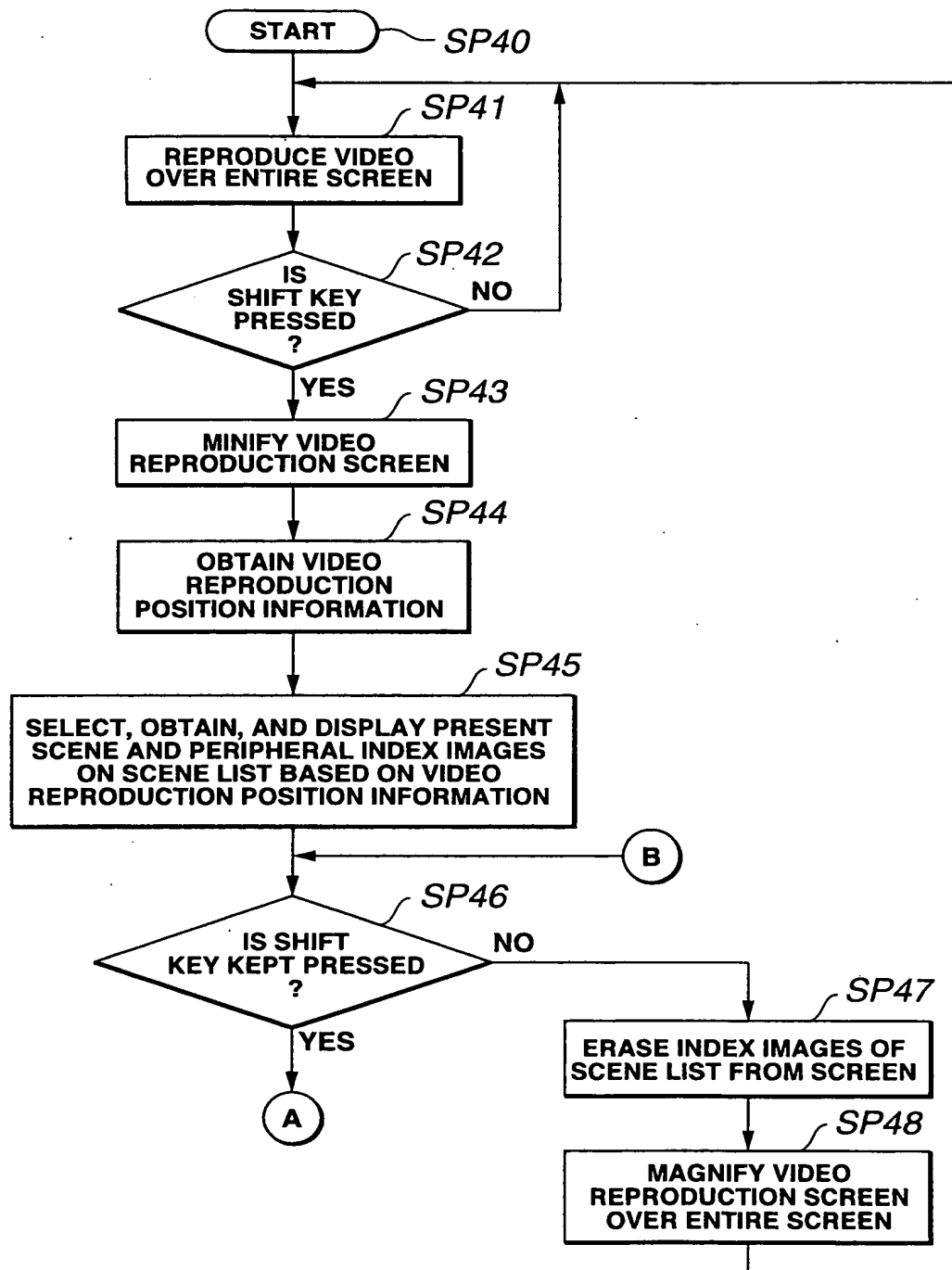
(C)



[FIG.28]

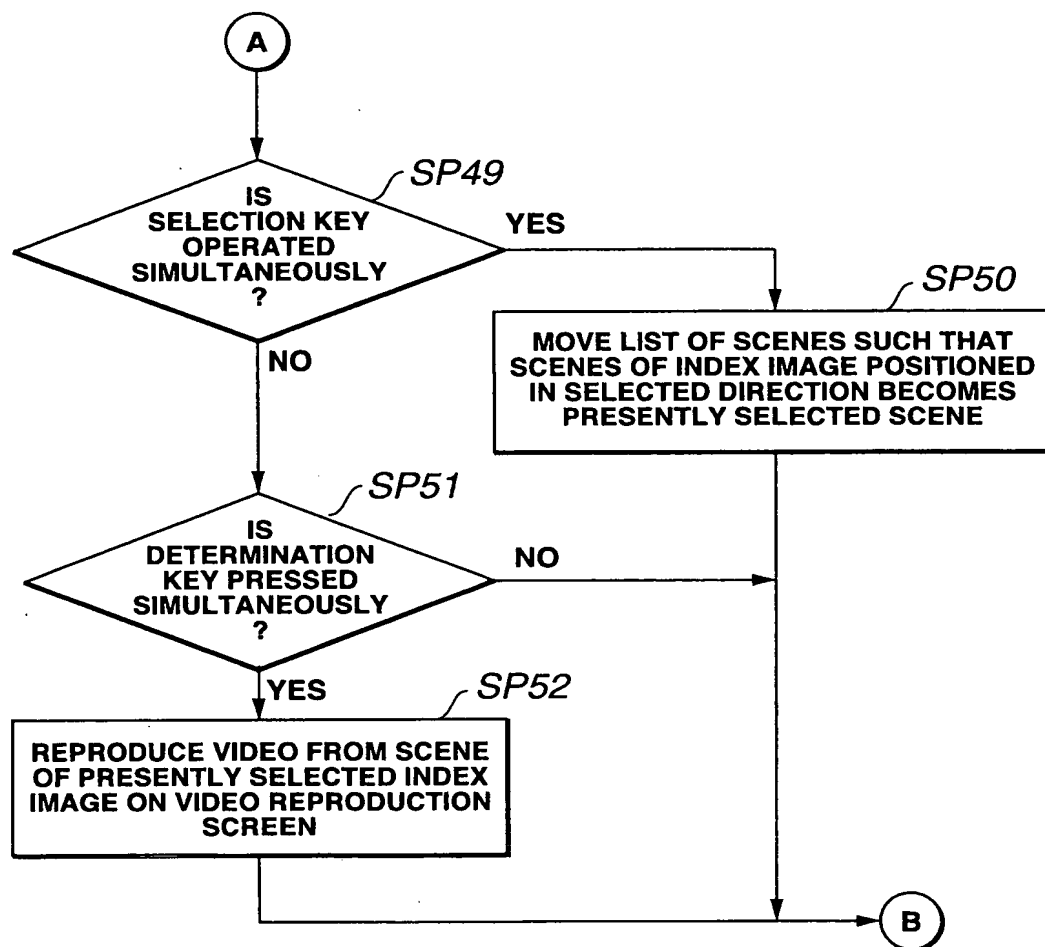


[FIG.29]

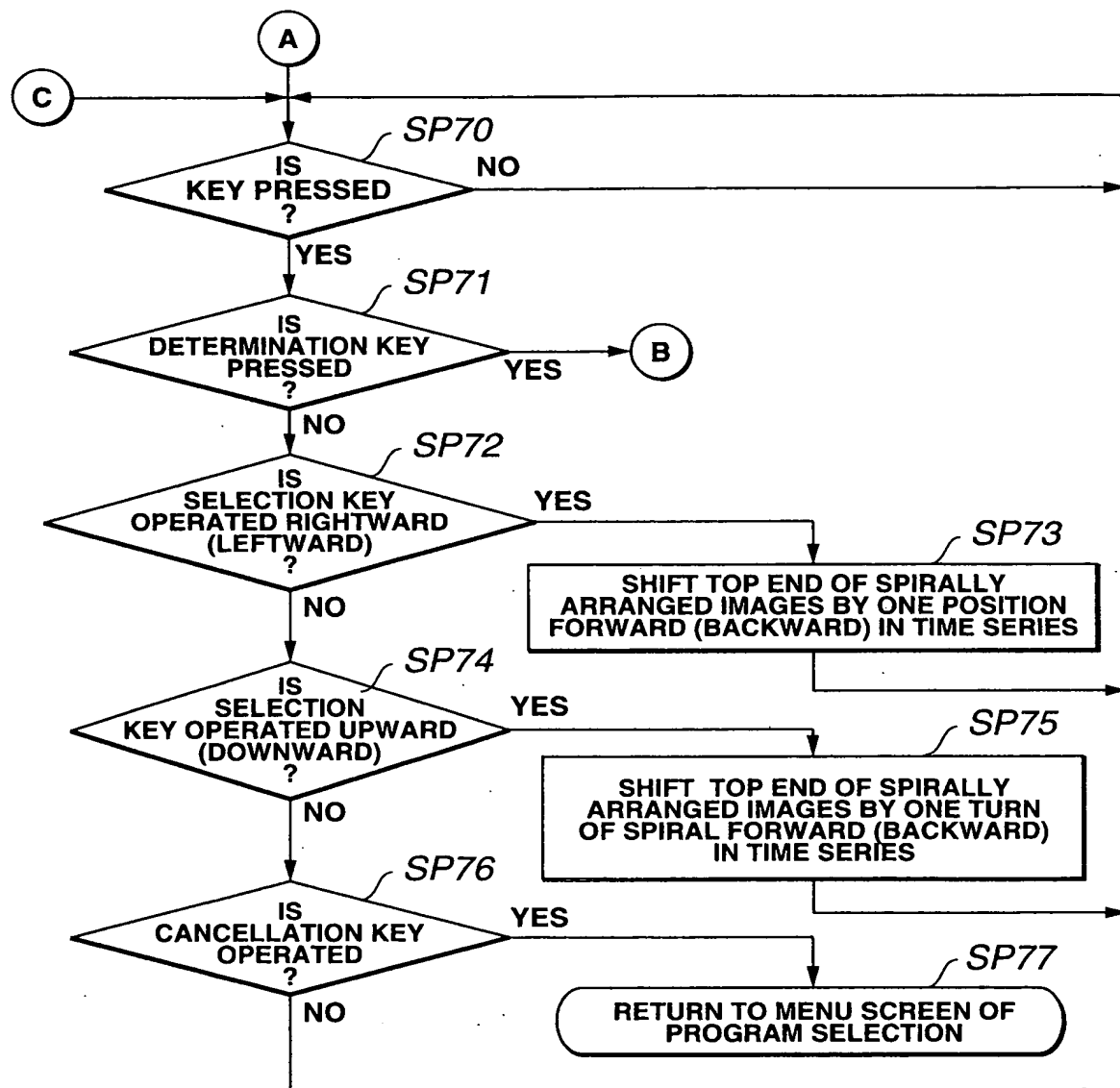




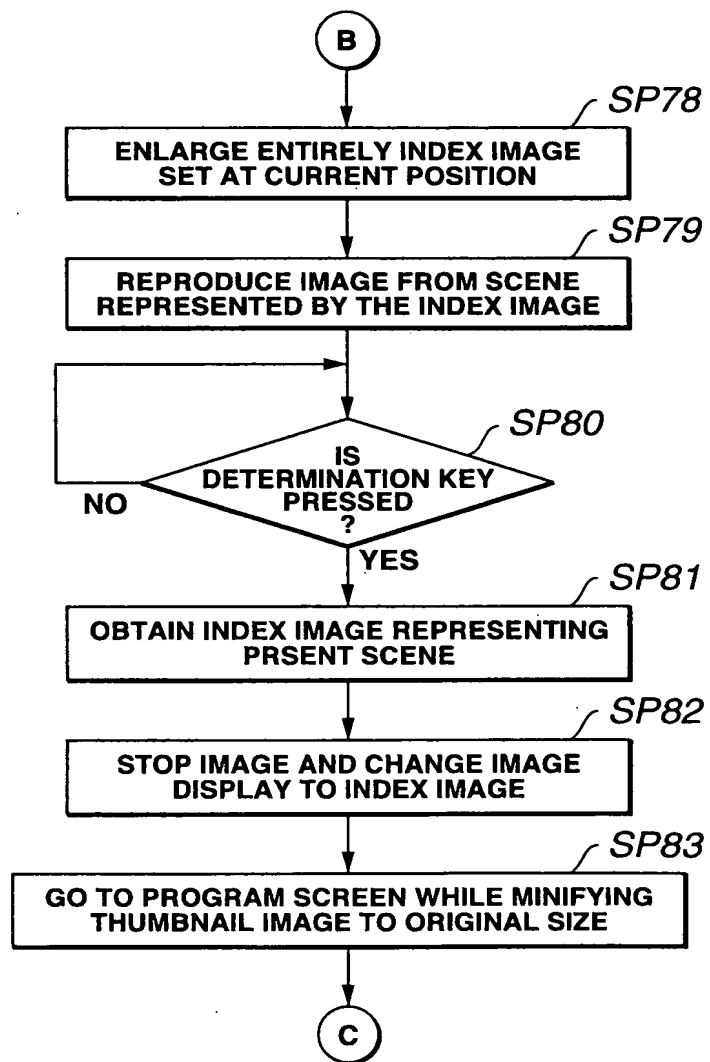
[FIG.30]



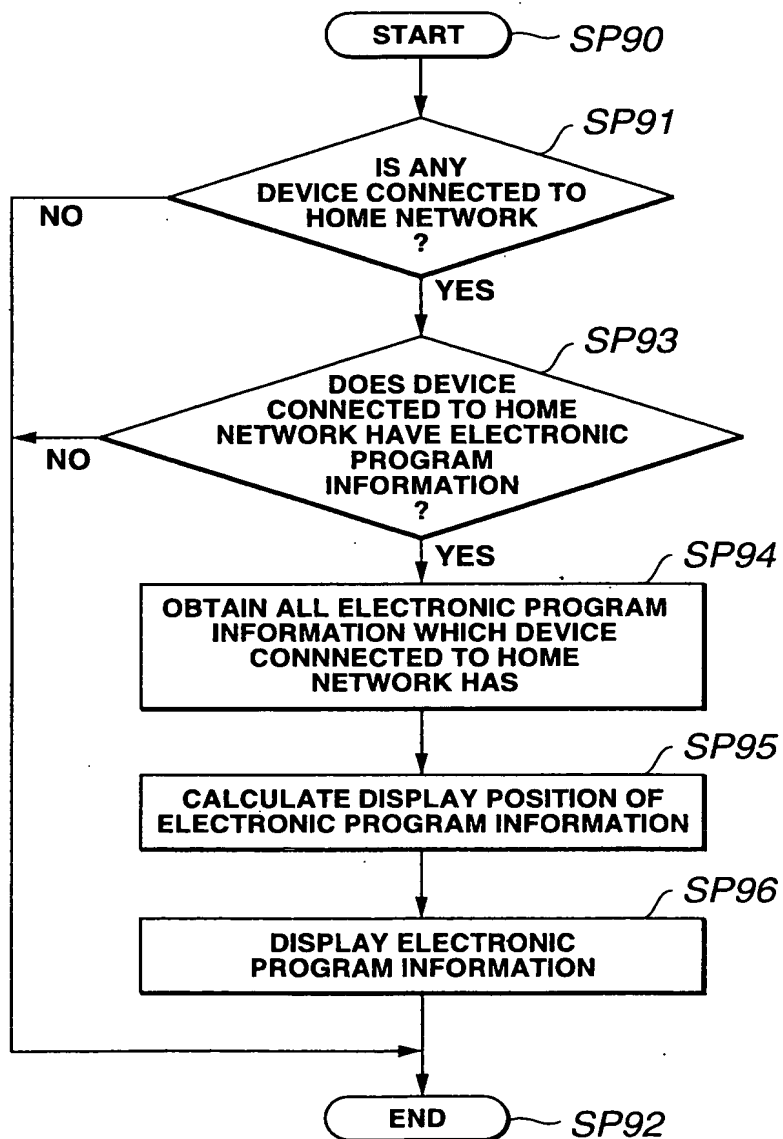
[FIG.31]



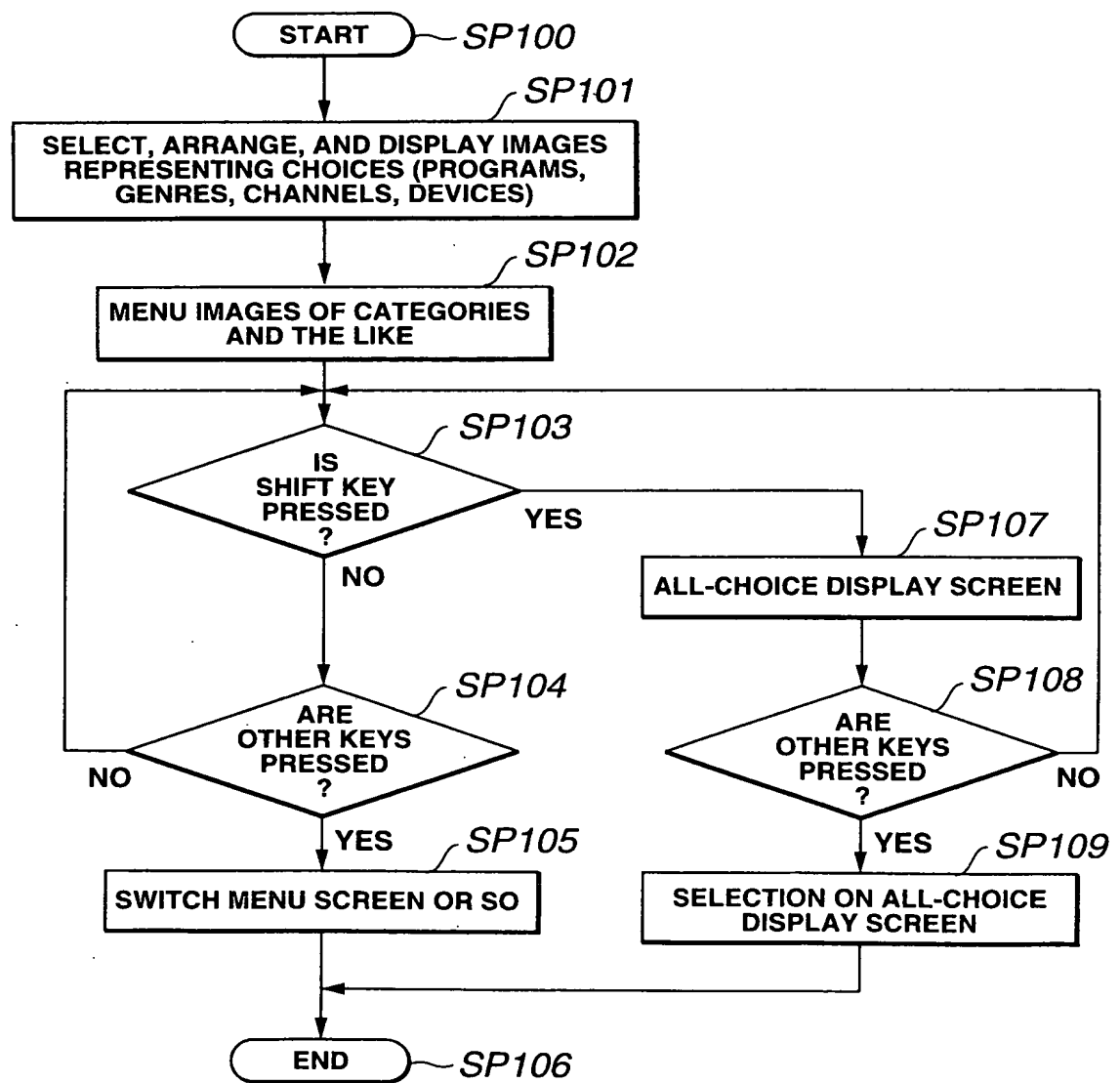
[FIG.32]



[FIG.33]



[FIG.34]



[Name of Document]    ABSTRACT

[Summary]

[Task]

The present invention relates to an information providing apparatus and an information providing method, and is applied to, e.g., set-top box of digital satellite broadcasting service, whereby even in the case where information screens such as a large number of programs, etc. are provided from plural information sources, selection of a desired program, etc. is easily and quickly enabled.

[Means for Solution]

Information for index is acquired through network to categorize information screens by the index information thus obtained to form menu screen.

[Selected Drawing]    FIG. 1